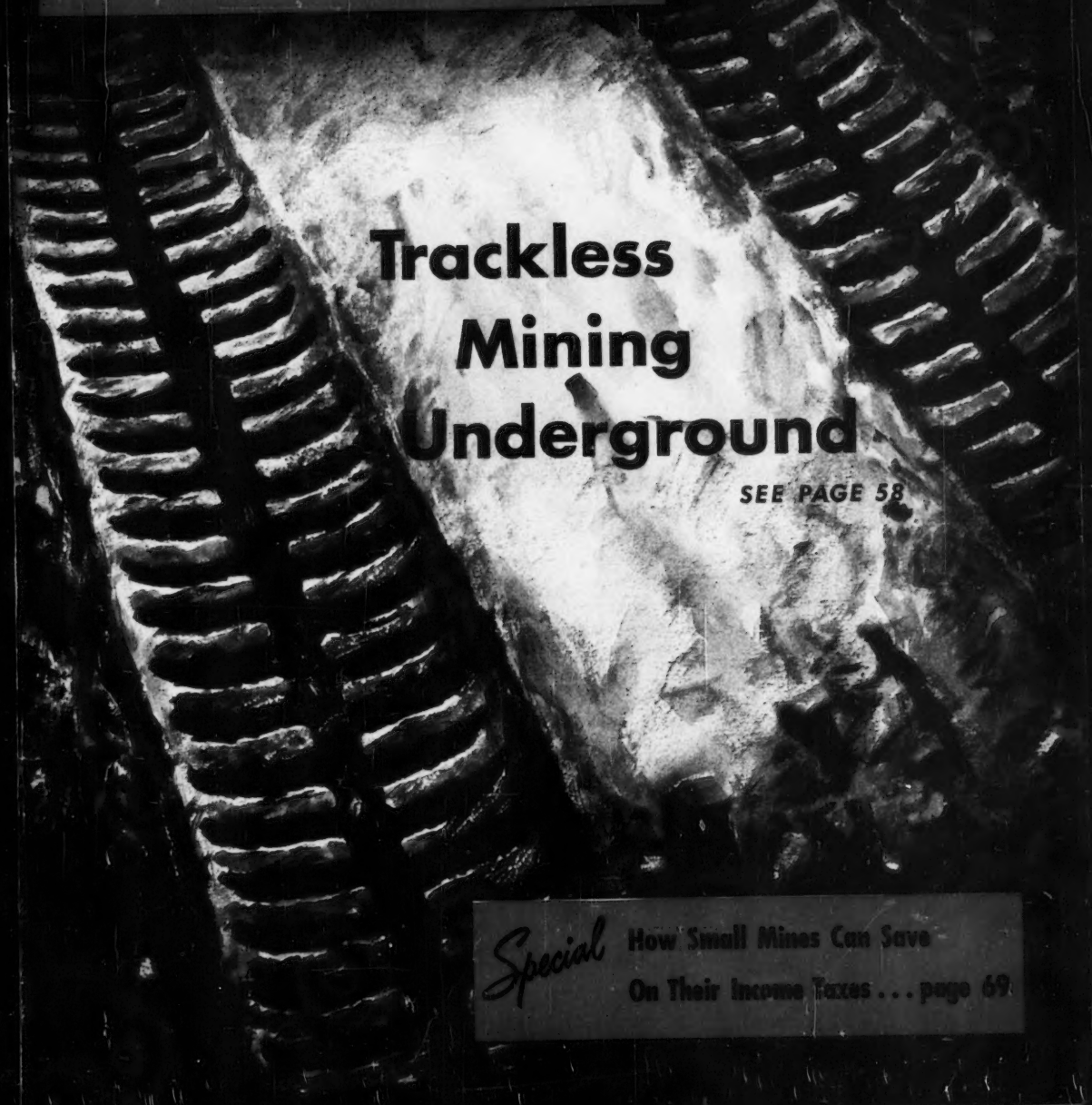
ENGINEERING AND MINING JOURNAL

A McGRAW-HILL PUBLICATION

JANUARY 1951

FOUNDED 1866



Trackless Mining Underground

SEE PAGE 58

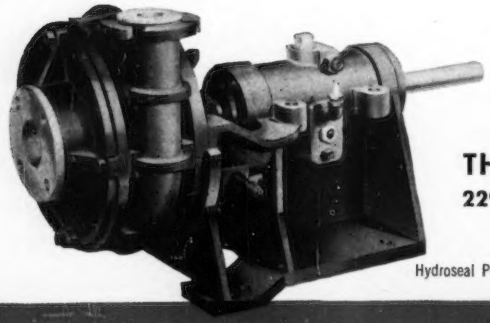
Special How Small Mines Can Save On Their Income Taxes . . . page 69

If you can change a tire

●●● you can put a new shell liner in a Hydroseal Pump—in fact, it's an easier job. That's because these liners are moulded to shape from flexible, super-tough Maximix Rubber—the material that outlasts metal 4 to 6 times under similar service conditions. Other Maximix parts fit just as quickly into place, and upon reassembly are mechanically locked in the correct position. No cementing or vulcanizing is required. Matching machined surfaces give a positive means for swift, accurate reassembly.

Another thing you'll like about these pumps is that the Maximix Rubber parts weigh 80% less than metal equivalents. This feature means much easier handling, and it will also save you a lot on shipping costs.

For complete details on this pump that's engineered for long runs and short stops, write for Catalog 850.



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Hydroseal Pumps are also made with alloy wearing parts for coarse material service.

HYDROSEAL SAND, SLURRY & DREDGE PUMPS
MAXIMIX RUBBER PROTECTED

HYDROSEAL PACKLESS AND MAXIMIX DESIGNS ARE COVERED BY PATENTS AND APPLICATIONS IN THE MAJOR MINING CENTERS OF THE WORLD

SAVE ALL FOUR WAYS

with this NEW I-R Drilling Combination

1. 28% LESS AIR with the NEW DB-35 Drifter

Ingersoll-Rand's new DB-35 Drifter, with the patented double-kicker port valve, has been especially designed to increase operating economy. Tests prove that this new drifter actually requires 28% *less air* per foot of hole drilled!

2. 33% LESS TIME PER ROUND with the NEW DJB-2 Boom Jumbo

Field reports conclusively prove that, when using the new DJB-2 Jumbo, rounds are drilled out in one-third less time than with old conventional methods. This is possible because of the tremendous reduction in set-up time and spotting the drills from hole to hole.

3. 33% FEWER STEEL CHANGES with the NEW Lightweight 48-inch Aluminum Shell

The greater length of this new 48" shell permits the use of longer drill steels — with 33% fewer steel changes for a given footage. Its lightweight aluminum construction cuts shell weight almost in half! In fact, it's even lighter than the old-style 30-inch steel shell and has equal or better life. This light weight is particularly important when drilling from a column or bar.

4. 50% MORE DRILLING SPEED when Carset Jackbits are used

These longer-wearing, faster-drilling Carset Jackbits, tipped with tungsten carbide, enable you to take full advantage of the potential savings offered by the new I-R drifter combination. Often drilling speeds can be increased by 50% or more, tonnage can be boosted 20% or better, and dynamite requirements can be cut as much as 30%.

Carset Jackbits have fourteen distinct advantages. Each one of them by itself makes a significant reduction in the cost of drilling rock.

For complete information check with your nearest Ingersoll-Rand office today. Let our engineers tell you more about this new cost-cutting combination.

Ingersoll-Rand

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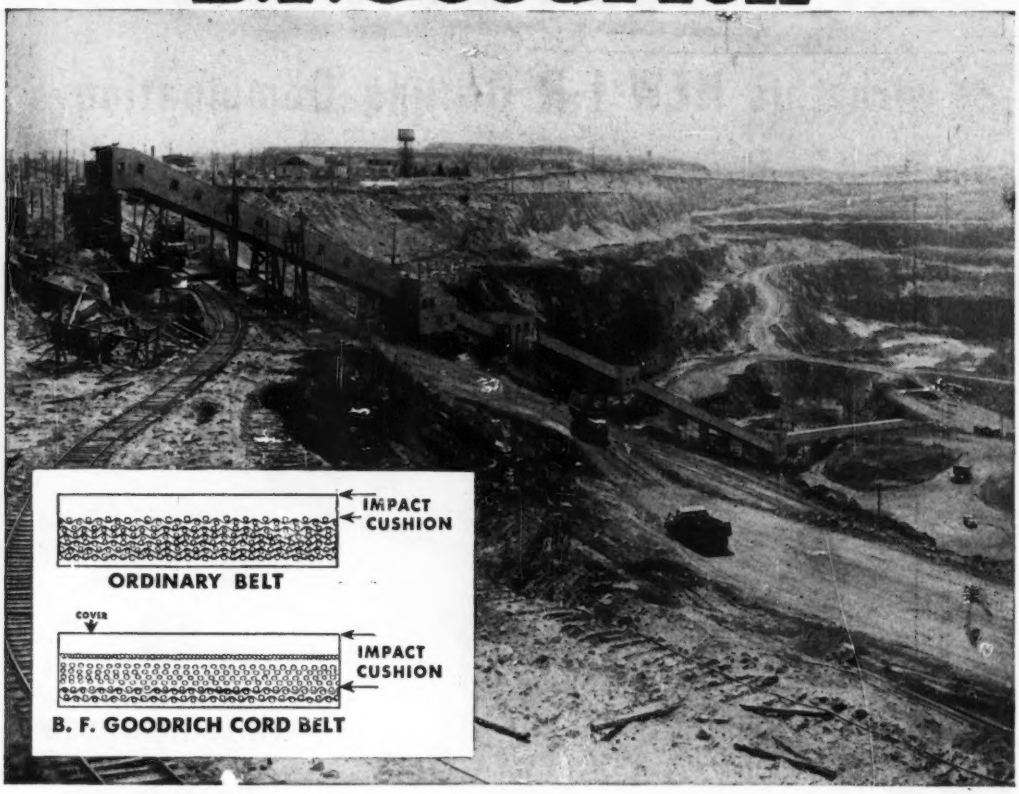
ROCK DRILLS • COMPRESSORS • AIR TOOLS • TURBO-BLOWERS
CONDENSERS • CENTRIFUGAL PUMPS • DIESEL AND GAS ENGINES

CARSET JACKBIT

RESEARCH KEEPS **B.F.Goodrich** FIRST IN RUBBER



Cord belt for tough jobs, longer centers, higher lifts

Gives 2 to 6 times greater impact resistance

WHERE you have heavy impact, long centers, high lifts, there's a special belt for your installation — the B. F. Goodrich cord conveyor belt:

Cord belt stands more impact — Each lengthwise cord in a B. F. Goodrich cord belt is completely surrounded by rubber — no cross threads tie them together. Cords are free to "give" when impact occurs. Rubber distorts temporarily, distributing and absorbing a shock that would damage stiff, unyielding plies. As an extra protection, B. F. Goodrich has added a patented *Transcord Breaker* — an extra layer of parallel cords in rubber, placed across belt width. Acts as a shock absorber, stretches to prevent gouges and cuts from splitting belt cover.

Cord belt troughs better — There being no crossweave in the cord plies, cords are free to flex. Belt conforms to idlers, pulleys. Spillage is reduced, troughing is natural and belt keeps centered on idlers, sustains less damage, requires less maintenance. Longer centers, higher lifts can be used.

Cord belt at work — Inside the housing shown here, a 3,000 ft. B. F. Goodrich beltroad handles iron ore in one of the largest mines on the Minnesota Iron Range. Installed in 1946, this belt has handled over 10 million tons. Estimated life is 10 more years, 30 million more tons.

The first B. F. Goodrich cord belt ever made is still on the job after 12 years and 14 million tons of rough-riding coal. If rock, coal, sand, gravel, ore or any other material rough-rides your conveyor, you can save money by calling in your local BFG distributor. *The B. F. Goodrich Company, Industrial and General Products Division, Akron, Ohio.*

Conveyor Belts BY
B.F.Goodrich

ENGINEERING AND MINING JOURNAL

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ABP ABC

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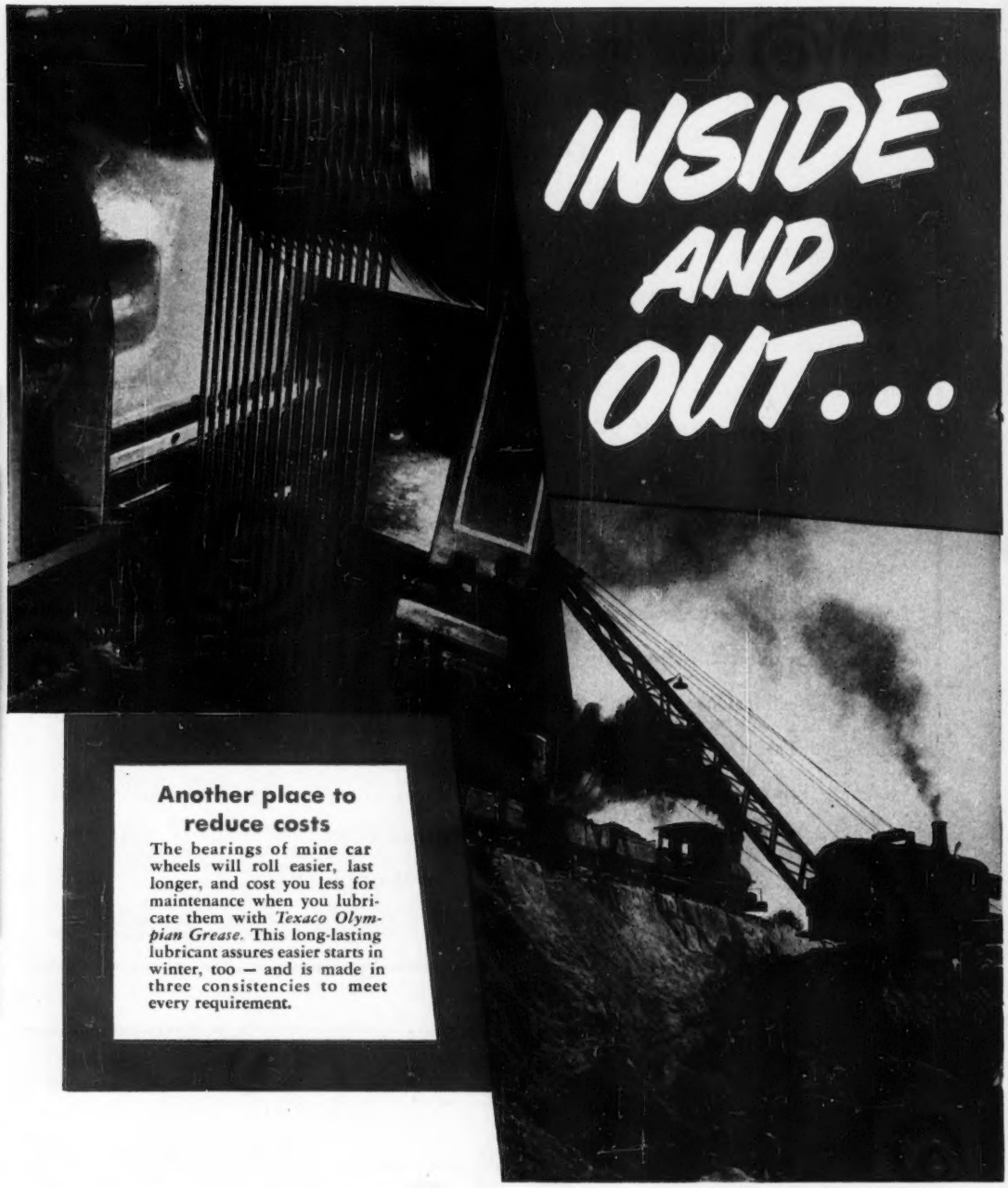

Another place to reduce costs

The bearings of mine car wheels will roll easier, last longer, and cost you less for maintenance when you lubricate them with *Texaco Olympian Grease.* This long-lasting lubricant assures easier starts in winter, too — and is made in three consistencies to meet every requirement.

TUNE IN . . . TEXACO presents MILTON BERLE on television every Tuesday night. METROPOLITAN OPERA radio broadcasts every Saturday afternoon.

TEXACO

TEXACO

TEXACO CRATER KEEPS WIRE ROPE STRONG LONGER

WHETHER your wire rope is an inside hoist or exposed to weather, you can give it inside-and-outside protection with *Texaco Crater*. This famous lubricant penetrates inside the wire rope and protects the hemp core. On the outside, it forms a tough coating that gives the strands long-lasting protection against wear and rust. No wonder *Texaco Crater* is the *preferred* lubricant to keep wire rope strong longer!

To keep open gears in top condition, brush or spray them with *Texaco Crater X Fluid* – the lubricant that *goes* on as a liquid and *stays* on as a tough, wear-reducing coating that lasts and lasts. *Texaco Crater X Fluid* assures quieter operation, longer gear life, lower maintenance costs.

In mines everywhere, cost-saving Texaco lubricants are preferred. In fact –

More copper mining equipment in the U.S. is lubricated with Texaco than with any other brand.

A Texaco Lubrication Engineer will gladly help you make savings in the maintenance and operation of all your machines. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

Lubricants and Fuels
FOR THE MINING INDUSTRY

3 TOURNAROCKERS beat rough roads, steep grades, and close quarters

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35 m.p.h., 16-ton Tournarocker

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hauling ROCK at Pine Canyon

One of the toughest of highway jobs cuts along the steep side-walls of rocky Pine Canyon near Wenatchee, Washington, and gives further proof of the ability of LeTourneau's modern, big-tire, rear dumps to handle rock or ore. With over 600,000 yards of shovel rock to be carved from the cliff face in relocating 4.4 miles of U. S. 2, Goodfellow Brothers, Inc. assigned the most difficult hauling to 3 LeTourneau 16-ton Tournarockers. Some material was sidecast . . . much of it had to be dumped to widen the narrow mountainside trail. Commenting on his Tournarockers, James B. Goodfellow says . . . "VERY SATISFACTORY".

Here are contractor's own figures

Loading under a 2-yard rock shovel, the Tournarockers carry 9 to 11 bank yards each trip. On one 2800-foot, one-way haul, actual job records show that Tournarockers easily handle shovel production of 1000 yds. every 8-hour shift. This rate of production, day in, day out, helps keep the job on schedule in spite of the rough haul roads, steep grades, and confined hauling conditions at altitudes of 2000 feet.

13' 9" turn radius speeds handling

Short, 90° turns, and positive electric steer by push-button control, permit easy turning and spotting anywhere along the narrow trail for load and dump position. Oversize, disc-type air brakes on all 4 wheels (4176 sq. in. total braking surface) give operators complete safety throughout the hauling cycle. Positive holding action of 4-wheel brakes . . . plus front-wheel drive on 186 h.p. Tournapull prime mover . . . let the Tournarockers dump safely out over the edge of mountainside fills. Simple electric hoist raises body to vertical position . . . streamlined bowl clears loads instantly.

Important savings for you

These same revolutionary Tournarocker advantages that are helping Goodfellow Brothers, Inc., lick steep slopes and rough going on the Pine Canyon project offer new low-hauling costs for your mines and quarries. Ask your LeTourneau Distributor about this 16-ton, rear-dump Tournarocker. He can also give you complete information on 9-ton and 35-ton Tournarockers . . . and will show you money-saving interchangeability with Carryall Scrapers, bottom-dump hoppers, cranes, flat-beds and other auxiliary hauled units. Your investment dollar provides extra insurance for the future with interchangeable auxiliary units that cost only approximately 25% of original unit cost. Write or call NOW!

Big target . . . Operator on Goodfellow Brothers' 2-yard shovel has large target with Tournarocker's 12' 5" x 8' top opening . . . speeds shovel swings, has less spillage.

Rock body . . . Here's a typical load of big-chunk rock carried by Tournarockers along Pine Canyon's slopes. 186 h.p. for 16-ton capacity licks the toughest hauling conditions.

90 turns with positive power steer . . . Short 13' 9" turning radius is an important advantage where operators have to turn and dump their loads along these narrow trails.

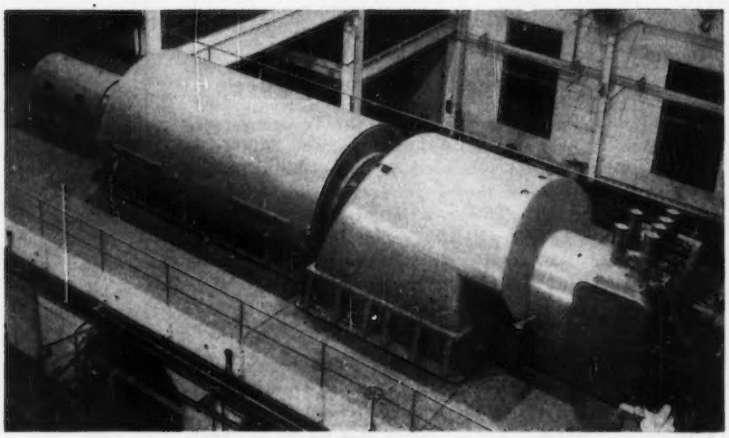
Front-wheel drive . . . Means you can keep the drivewheels of the prime mover on firm ground. Front or rear wheel air brakes can be set independently.

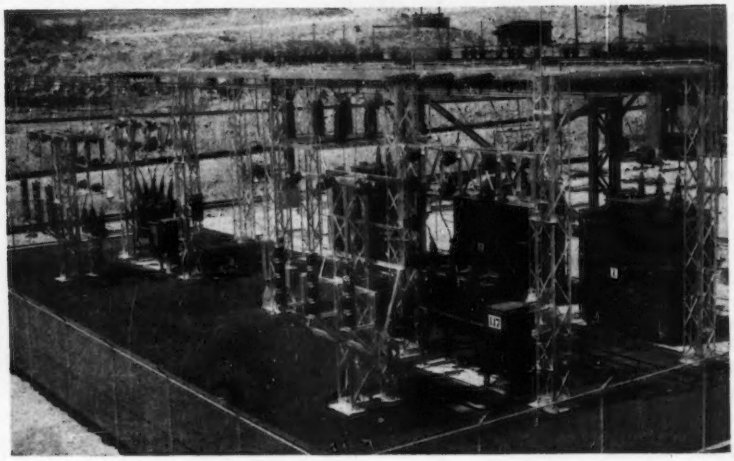
LETOURNEAU
PEORIA, ILLINOIS
TOURNAROCKERS

HIGH SPEED on RUBBER PLUS TRACTION ADVANTAGES of a CRAWLER

Powered for low-cost high-tonnage refining!

1 Typical of the mining industry's increasing electrification to handle high tonnages at low cost is this new copper refinery at Garfield, Utah, which has a capacity of 12,000 tons of refined copper per month, with provision for expansion to 16,000 tons. Power for the refinery and other operations comes from Kennecott's power station, where three G-E steam turbine-generators (two of 25,000 kw each, plus the 50,000-kw unit shown here) generate 13.8-kv power which is stepped up to 44 kv for transmission.



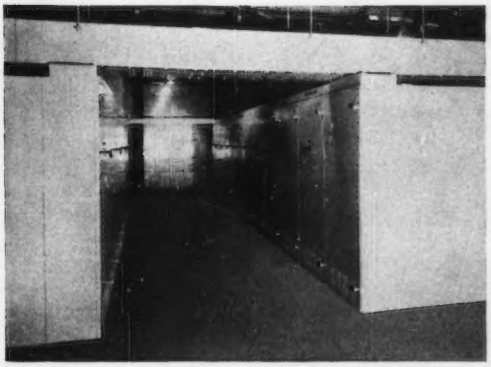


2 At the refinery, three miles away from the power plant, incoming 44-kv power is stepped down to 13.8 kv at this G-E package substation. Completely co-ordinated, it includes an outdoor steel switching structure, three 7500/9375-kva power transformers (with provision for addition of a fourth) and necessary metal-clad switchgear. G-E package substations, made in many standard combinations to fit all mining-industry needs, come in factory-built sections ready to install. They simplify ordering, save engineering time, speed installation, cut costs.

GENERAL ELECTRIC

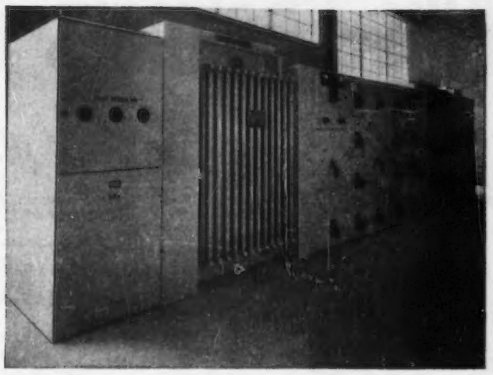
660-20

In its new electrolytic refinery, Kennecott Copper Corporation uses this General Electric generation, conversion, and distribution equipment to help maintain production continuity



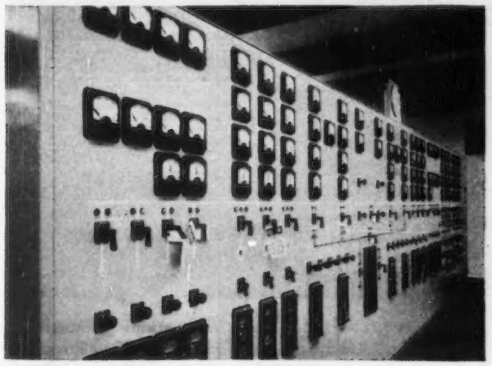
3 Inside the refinery, protecting all 13.8-kv feeders and personnel as well, is this G-E metal-clad switchgear that provides flexibility for future load changes.

4 A-c is converted to d-c for electrolytic cell lines by six G-E motor-generator sets, each including a 2900-hp synchronous motor and two 1000-kw, 125-volt d-c generators.



5 Four G-E 1500-kva double ended load-center substations (one shown) step down voltage from 13,800 to 480 and provide distribution at centers of load to reduce power losses.

6 This G-E panel — controlling package substation, a-c switchgear, and d-c power for electrolytic cell lines — helps centralize and co-ordinate plant operations.



CO-ORDINATED POWER SYSTEMS

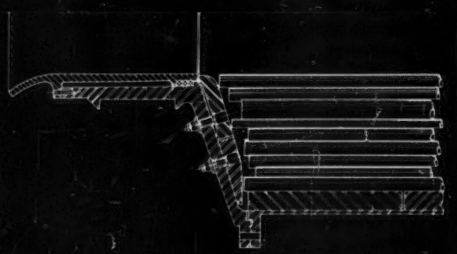
for the Mining Industry

Whatever your mining or processing problem, a good man to know is the mining industry specialist in your nearby G-E office. Ask him about power-system equipment for *your* plant to protect service continuity, help boost production, cut costs. *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

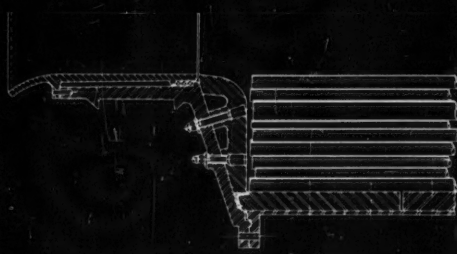
Allis-Chalmers Builds Rod Mills with Straight *INSTEAD OF SLOPING* End Liners

HERE'S WHY...

- **Less Rod Overlap**
- **Less Wasted Grinding Area**
- **Less Gouging of End Liners by Protruding Rod Ends**
- **Better Grinding Efficiency... Less hp per ton**
- **Minimum Tramp Oversize in Product**



Sloping end liners invite this condition. Rods overlap, causing wasted grinding area at rod ends and excessive wear on end liners.



Vertical end liners keep rods even in mill. Wear on end liner is greatly reduced. All of rod length is utilized for useful grinding.

STRAIGHT END LINERS mean better grinding performance all around . . . with less costly maintenance. That's why vertical end liners are standard on Allis-Chalmers rod mills.

It adds up to this—close control of product top size . . . and less hp required to grind more product. All available rod length is utilized. No wasted power caused by rod overlap. The actual gain in grinding efficiency with vertical end liners may be as high as 2 percent!

Allis-Chalmers is the *only manufacturer* building large rod mills with vertical end liners. Other reasons why it pays to specify Allis-Chalmers for grinding mills:

- **There's no pocket between end liner and head at trunnion end to fill with pulp and form a race. This space is filled with cement before end liner is installed.**
- **Three packing rings seal space between trunnion liner and trunnion.**
- **Trunnion bearings on larger size mills are equipped with an individual high pressure lubricating pump to "float" the mill for starting. No destructive bearing wear caused by high starting torque.**

There is an Allis-Chalmers engineer-consultant in your area who can point out other advantages of A-C grinding mills... and help you work out your grinding problems. Call him, or write Allis-Chalmers, Milwaukee 1, Wis.

Allis-Chalmers builds overflow, center and end peripheral discharge rod mills; ball, pebble and preliminator mills; multi-compartment Compeb and Ballpeb mills.

Compeb and Ballpeb are Allis-Chalmers trademarks.

A-3241

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Sales Offices in Principal Cities in the U. S. A. Distributors Throughout the World.

Motors | Controls | Texrope Drives | Vibrating Screens | Jaw Crushers | Kilns, Coolers, Dryers

Team for fast loading

TIME saved is indeed money earned when the job is loading pay material. Time-saving is biggest when you have power that not only works fast but works steadily . . . for down-time, on the other hand, can easily turn savings into losses. The loss doubles when the job requires a team of interdependent machines — for when one goes down the other becomes inactive too.

The Federal Chemical Company (Tennessee) minimizes such happenings by using dependable power: "Caterpillar" Diesel. For loading phosphate rock from a 2-acre storage pile onto railroad cars (see picture), a "Caterpillar" D7 Tractor 'dozes the material to a dragline powered with a "Cat" D13000 Engine. An average of 112 ton-yards keeps piling into 50-ton railroad hopper cars per hour. Outstanding operating advantages, according to Federal's Tom S. Miller, are speed and very little down-time. " 'Caterpillar'-powered equipment," he adds, "fills the bill best for us under the trying conditions of phosphate mining."

Leading manufacturers of all types of mining and excavating equipment have engineered their machines to be powered by "Caterpillar" Diesels. You can standardize on power by specifying "Caterpillar" Engines on your machinery purchase order.

Today the importance of "Caterpillar" products, both for military use and for maintaining the national economy, is greatly increased. Talk over your machinery requirements with your "Caterpillar" dealer. He has ample parts stocks to keep your present equipment doing its job and will do his utmost to make prompt delivery of new machines.

CATERPILLAR, PEORIA, ILLINOIS

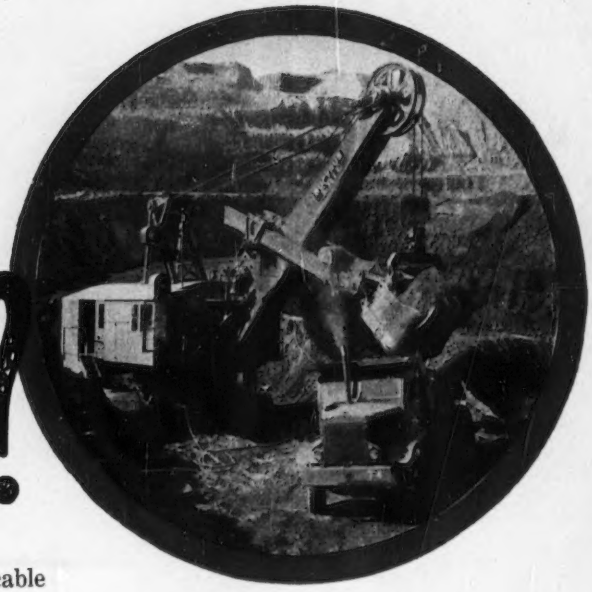
LOOK UNDER THE HIDE

Connecting rods for "Caterpillar" Diesels are made of medium carbon steel, drop forged and heat treated. Of "H" section design, they are rifle drilled to provide oil passage to the piston pin, and to oil-cool the piston. Connecting rods are balanced to close limits. Crankpin bearings are solid aluminum alloy, precision type. Piston-pin bushings are bronze and are precision bored. Look under the hide for built-in quality.

CATERPILLAR

DIESEL ENGINES · TRACTORS · MOTOR GRADERS
EARTHMOVING EQUIPMENT

WHY TIREX?



Why is TIREX so often the cord or cable specified to serve portable electric tools and apparatus where operating conditions are severe? Why? Because cured-in-lead Simplex-TIREX Cords and Cables can't be beat for the toughness and electrical stability that are so necessary to efficient portable cord and cable performance.

In the operation pictured above, for instance, a TIREX cable is expected to, and does, deliver unfailing service to the giant shovel that's loading valuable iron deposits on the Mesabi range. The performance of the cable largely determines the shovel's output. And output must be high!

But look at the conditions under which the cable must work. It is dragged over abrasive iron ore, subjected to runovers by trucks and shovel crawlers. It is exposed to burning sun or foul weather, and to the hazards of grease and oil. Only a cable design that provides extra toughness and lasting stability of its electrical properties will carry on under punishment like that.

Such a design is standard for all TIREX products. It is your assurance of satisfaction from every investment in TIREX Portable Cords and Cables. Whether you're equipping small hand tools, heavy machinery, motors, welding or lighting units, specify and be sure that you get genuine Simplex-TIREX Cords and Cables. For complete information, write us direct or call in the Simplex representative nearest you.

Simplex

WIRES & CABLES

SIMPLEX WIRE & CABLE CO., 79 SIDNEY ST., CAMBRIDGE 39, MASS.

IF IT'S A REAL ROCK SHOVEL

it means BIG OUTPUT IN ANY DIGGING!

Northwest Rock Shovels have met the *test of Rock.* Their ability in tough digging is proved in literally hundreds of installations. Smooth operations in close quarters, digging force that makes handling the big ones easier, steering that negotiates rough pit floors and benches, ease of control that can be depended on regardless of temperature or weather, assure output day in and day out.

If you are planning on new equipment you should know about Northwest advantages—Uniform Pressure Swing Clutches, the Cushion Clutch, the Northwest Dual Independent Crowd, Differential Steering, the "Feather-Touch" Clutch Control and other Northwest features—and remember, if you have a real Rock Shovel you are sure of *output* in any digging. We'll be glad to tell you more about it now—so you can plan ahead. Make your next shovel a Proved Rock Shovel.

NORTHWEST ENGINEERING COMPANY
1509 Field Building, 135 South LaSalle Street, Chicago 3, Illinois

NORTHWEST

Convertible for any Mining Material Handling or Excavation Problem

NO-TURN shuttle haul..

Dumptors®

SAVE TURN TIME GAIN HAUL TIME

On every haul cycle, Koehring fast-shuttling Dumptors eliminate slow turns — at the loading unit, at the dumping point, on sharp, "zig-zag" grades. They gain *more* productive haul time, because Koehring constant-mesh transmission gives the same 3 fast speeds forward and reverse. Here's how much no-turn shuttle operation can increase your production:

By eliminating only 2 turns on a 1,000' haul, time studies prove that Dumptors can save 30 seconds every round trip, and increase hourly yardage output over 10% per unit. What's more — fast, easy spotting and 1-second gravity dump keep production high.

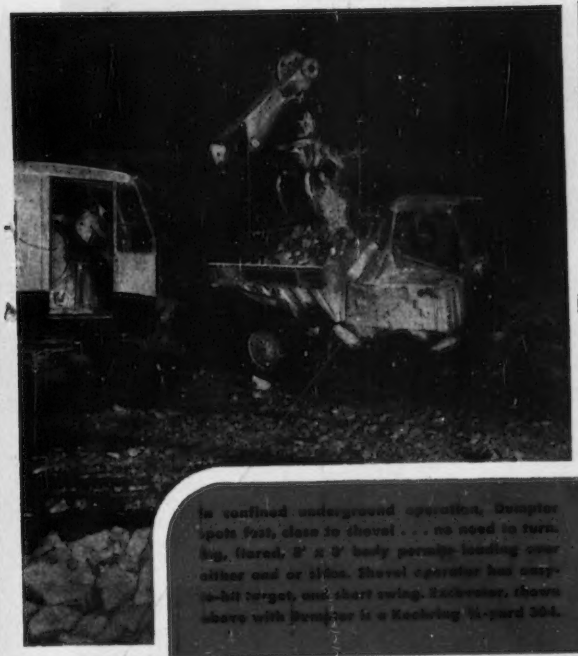
Remember, too — top hauling efficiency also means increased shovel output. For *double profit protection*, team fast-shuttling Dumptors with Koehring heavy-duty excavators. Four sizes: ½-yd., ¾-yd., 1½-yd., and 2½-yd.

KOEHRING COMPANY
MILWAUKEE 16, WISCONSIN
Subsidiaries: JOHNSON • PARSONS • KWIK-MIX

5,16

It will pay you to get complete facts from your Koehring distributor. Call him NOW.

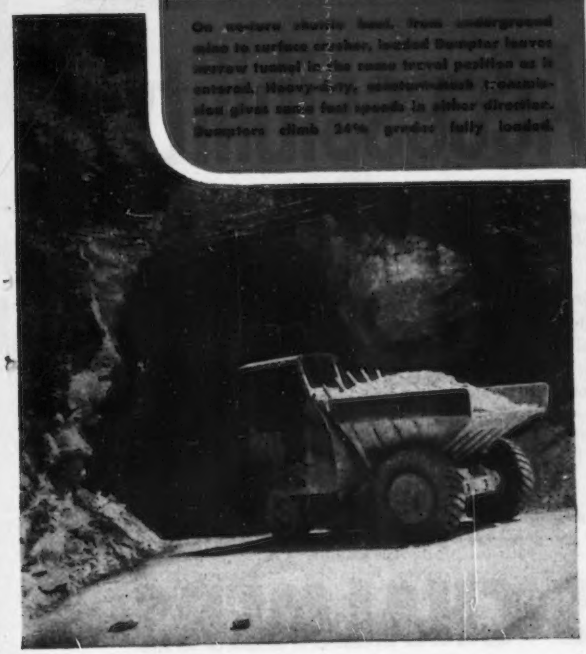
. . in open pits or underground



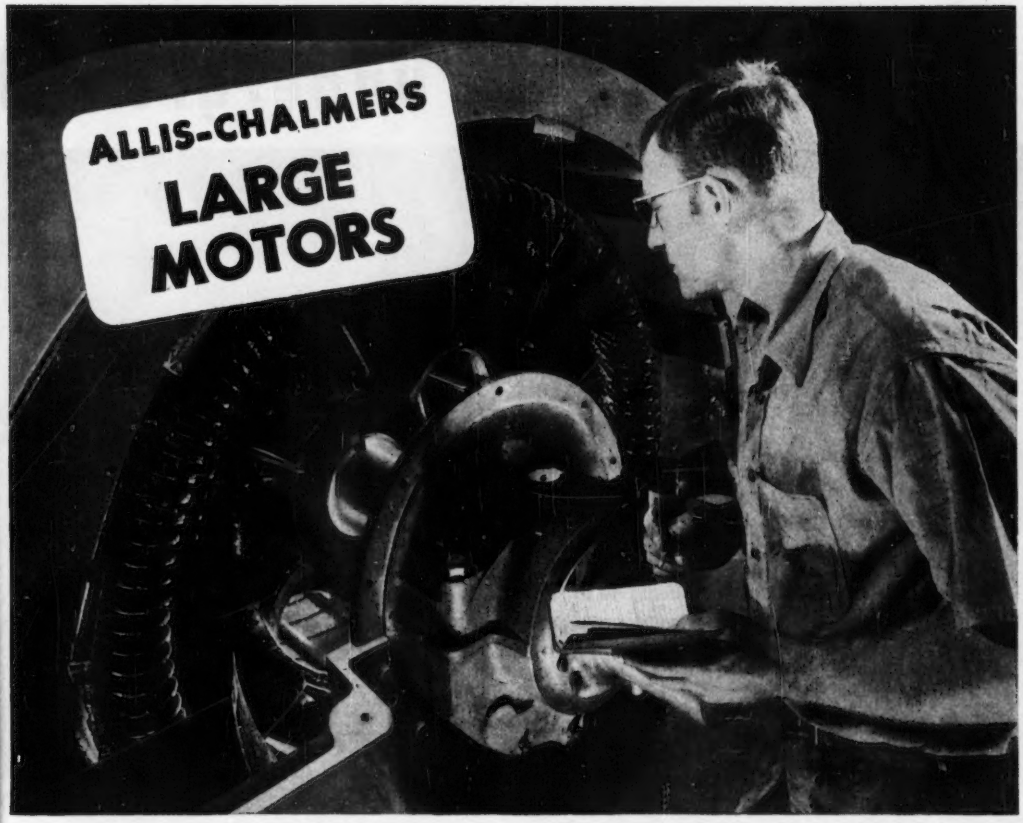
In confined underground operation, Dumpster spots fast, close to shovel . . . no need to turn. Big, flared, 8' x 9' body permits loading over either end or sides. Shovel operator has easy-to-hit target, and short swing. Backwater, shown above with Dumpster is a Koehring ¾-yard 304.

At dumping location there's no more jockeying around in crowded passageway. Dumpster drives up to conveyor, body forward . . . operator hits body release lever . . . gravity dumps 6-yard load in 3 second, and Dumpster is ready to head back for next load, without turning around.

On western shovel boat, from underground mine to surface crusher, loaded Dumpster leaves narrow tunnel in the same travel position as it entered. Heavy-duty, constant-mesh transmission gives easy fast speeds in either direction. Dumpsters climb 24% grades fully loaded.



There's no unproductive turning time . . . no waiting for slow body hoists. Gravity dump never balks . . . never wears out . . . eliminates body hoist mechanism. Dumpsters also save costly spring maintenance with one big double-coil chassis spring on steering axle.



HOW'S THIS FOR Accessibility?

ONE MAN can perform all routine maintenance jobs on this brand new line of Allis-Chalmers large motors. He can remove the upper halves of the end brackets and air baffles and reach right inside the motor with his vacuum cleaner or air hose. There is plenty of room to reach up back of the stator core through air discharge openings in the stator yoke.

Bearings Protected

The capsule-type sleeve bearings need not be opened up and exposed when the end bracket halves are removed. The bearings are protected from abrasive dust and dirt while the motor is being cleaned. This eliminates the work usually required to dismantle the bearing, clean and reassemble it during routine maintenance.

Easy Installation

Large stator air discharge openings with removable louvers allow ample room to use an electric or air drill for doweling and bolting the motor to the foundation. These large discharge openings plus adequate air intake openings in the end bells provide cooling air at low velocities.

Sleek Appearance

You'll be proud of the appearance of the new Allis-Chalmers motor in your plant, too. Clean, simple lines and smooth contours give outward confirmation of its inner strength.

These new design Allis-Chalmers drip-proof and splash-proof bracket bearing squirrel-cage induction motors are built in sizes from 60 hp at 300 rpm to 1500 hp at 1800 rpm. Ask your Allis-Chalmers representative to show you the details of this exceptional new motor or write Allis-Chalmers, Milwaukee 1, Wisconsin for Bulletin 05B7542. A-3251

ALLIS-CHALMERS

ROCK RATED!

THE NEW P&H MODEL 955-A (2½ YDS.)

with *MAGNETORQUE** swing

Watch this new machine get its teeth into a rock job and see what "rock-rated" really means to you. It's *designed* . . . every inch from boom point to crawler shoes . . . to make rock handling easier . . . more profitable for you.

Unbeatable—point for point

P&H Magnetorque eliminates swing friction clutches . . . their troubles and replacement costs. It gives you smoother, faster swings . . . for the life of your machine.

Greater Stability gives you more power at the tooth point . . . and greater work capacity.

Direct Acting Hydraulic Control . . . easier on machine, easier on operator . . . smoother and greater holding power through full wrap brakes and clutches.

*Trade-Mark of Harnischfeger Corporation for electro-magnetic type clutch.

P&H Rapid Reversing Planetary Chain Crowd gives you snappier dipper action. It's more accurate. And crowd chain outlasts 25 to 30 crowd cables.

Get the facts about P&H all-welded strength and Added Values! The 955A is a 2½ yd. version of the P&H 1055 (3 yd. shovel) . . . the machine that has set new low-cost production records everywhere. Write for Bulletin X122, today.

P&H **EXCAVATORS**
4454 West National Ave.
Milwaukee, Wisconsin
HARNISCHFEGER CORPORATION

EXCAVATORS • OVERHEAD CRANES • HOISTS • ARC WELDERS and ELECTRODES • SOIL STABILIZERS • CRAWLER and TRUCK CRANES • DIESEL ENGINES • CANE LOADERS • PRE-ASSEMBLED HOMES

UNDERGROUND, OR . . .

IT'S JOY EQUIPMENT

Right: The Joy Drillerchile, a crawler-mount, self-propelled, highly mobile portable machine gives you maximum coverage at least cost per foot of hole. Features Joy Hydro Drill Jibs for fast, accurate hole-positioning, and remote control.

Above: For high-production loading and haulage of rock and ore, Joy teams of trackless loaders and electric or diesel shuttle cars get the call underground.

Right: Complete range of Joy Stopers includes the new S-91T, with telescopic feed. Requires fewer steel changes, gives more time for drilling.

Below: Joy Wagon Drill specially adapted to drill at any height from toe-holes to horizontals 9' high.

Left: The Joy HS-15 high speed drill for underground blast holes, or core drilling to 500'. Compact and easy handling, with "in-line" vibrationless drive.

Below: Joy Hydro Drill Jibs are versatile units; can be mounted as required to suit individual needs. This truck-mounted Jib is an example.

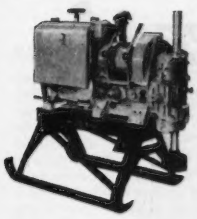
. . . ON THE SURFACE

FOR GREATER TONNAGE FOR LOWER COSTS

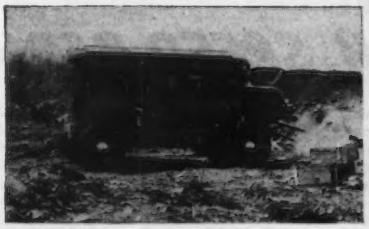
Above: Joy builds a complete line of "Silver Streak" Hand Tools, cadmium-plated for rust protection and easier running in.

Above: Joy Wagon Drills (Medium and Lightweight models) are easily maneuvered units with positive locking brakes for quick set-ups and balanced drilling on any terrain.

Above: Joy Champion Rotary Drills set absolutely new standards in high-speed, economical blast hole drilling, far outperforming all others. Built in two self-propelled models, for diesel, gasoline engine or electric motor drive.

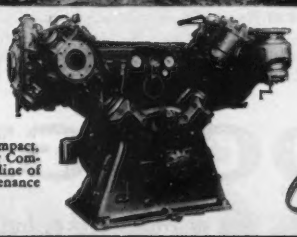


Above: Joy Core Drills range in capacity from 250 to 1750 feet of 1½" hole. Screw feed or hydraulic types—gasoline, diesel, air or electric drive.



Left above: Joy's popular Series 80 Portable Compressors, with the famous "Econo-Miser" load control, are built in seven sizes, from 60 to 630 CFM.

Above: Joy Hydro Drill Jibs are readily adaptable to truck-mounting, etc. for secondary drilling or toe-holes in quarries or open-cut mining.



Right: Joy pioneered the compact, modern "package-type" Air Compressor—offers a complete line of highly efficient, low maintenance airplants up to 3656 CFM.

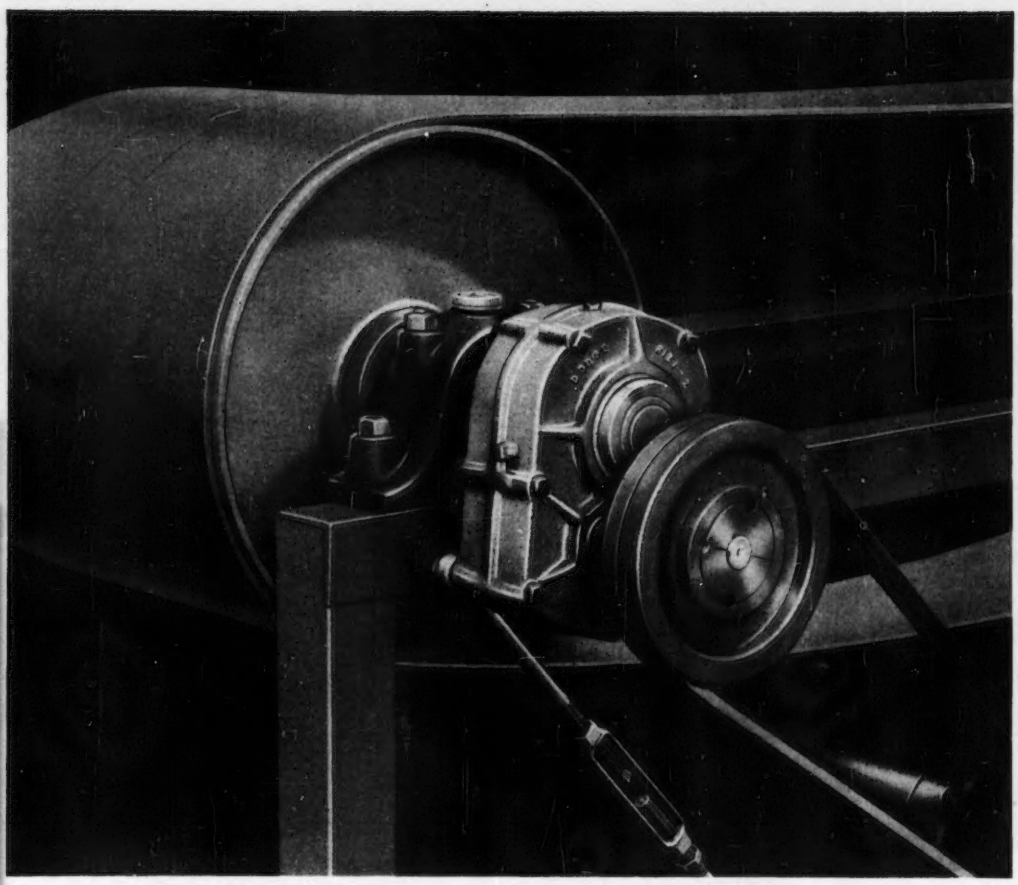
Consult a Joy Engineer

W&D H-3363

JOY MANUFACTURING COMPANY

GENERAL OFFICES: HENRY W. OLIVER BUILDING · PITTSBURGH 22, PA.

IN CANADA: JOY MANUFACTURING COMPANY (CANADA) LIMITED, GALT, ONTARIO



IT'S THE NEW DODGE

TORQUE-ARM SPEED REDUCER!

TRADEMARK

NEW COMPACTNESS!

NEW DOUBLE LOCK ON SHAFT!

NEW RUGGEDNESS!

NEW SAVINGS!

HEAR what actual users say: "It saved us 32% over a floor-mounted installation!"—"That new sealed-in back stop sold me!"—"The turnbuckle is a mighty handy belt tightener!"—"Never saw so much performance in such a little package!"—"Smooth and quiet—and it's got guts!"

If you haven't yet seen this great new speed reducer, you've missed something. Available from *stock*, with stock-product economy and convenience. Six sizes with capacities up to 25 H. P. Any output speed from 13 to 133 R.P.M. No special engineering—accurate selection is simple.

WRITE us for special bulletin No. A470 including complete description, specifications and easy-to-use selection table.

DODGE MANUFACTURING CORPORATION, 3100 Union St., Mishawaka, Indiana

CALL THE TRANSMISSIONEER, your local Dodge Distributor. Factory trained, he can give you valuable assistance on new, cost saving methods. Look for his name under "Power Transmission Equipment" in your classified telephone book.

DODGE

of Mishawaka, Ind.

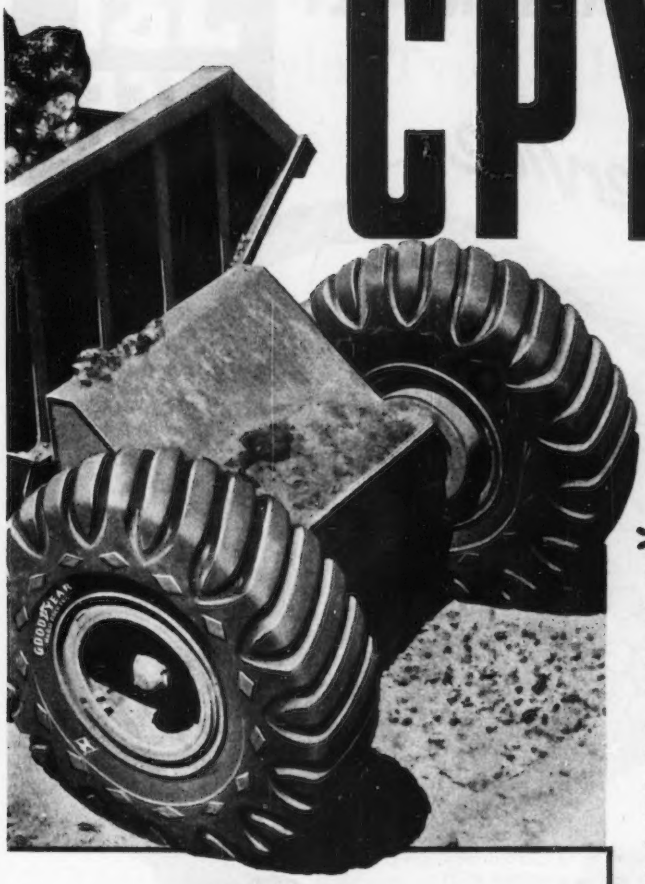
FIRST IN POWER TRANSMISSION MACHINERY

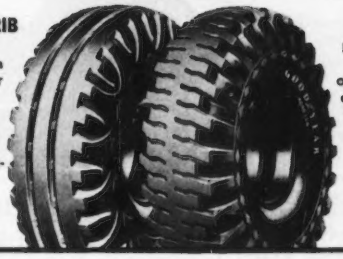
NAME PLATES

FOR YOUR NAME PLATE REQUIREMENTS, WRITE OUR SUBSIDIARY, CHICAGO THRIFT ETCHING CORPORATION, 1555 N. SHEFFIELD AVE., CHICAGO, ILLINOIS

CPY*

tells you why it pays always to BUY and SPECIFY Goodyear





HARD ROCK RIB
Companion tire for front wheels in rock work—easier steering, smooth rolling, same tough cord body, same rugged shoulder and sidewall as Hard Rock Lug.

ROAD LUG
Remarkable dual-purpose tire operates both OFF and ON the road. Combines off-the-road toughness and traction with on-the-road mileage and economy.

Road Lug—T. M. The Goodyear Tire & Rubber Company, Akron, Ohio

*

Cost per yard—the all-important factor that determines your profits. The *deciding* factor that makes *and keeps* Goodyear tires the First Choice of profit-minded quarry operators!

Outstanding example: Goodyear's famous Hard Rock Lug—super-tough champ for all types of rock work. Extra-thick undertread protects its extra-tough carcass against bruising—extra-heavy tread and sidewalls are armored by massive lug bars against cuts and rips—self-cleaning tread provides top traction.

All these extras add up to extra-low CPY—so much lower cost per yard, in fact, that operators find that Goodyear's Hard Rock Lug has no equal for cutting costs on tire-killing rock work.

We think you'll like "THE GREATEST STORY EVER TOLD"—Every Sunday—ABC Network

GOODYEAR

MORE TONS ARE HAULED ON GOODYEAR TIRES THAN ON ANY OTHER KIND

WHY MINE OPERATORS GET

J&L STEEL

30% to 60% Longer Service

FROM WIRE ROPE OF THIS DESIGN

Mine operators get 30% to 60% and even *longer* service from wire ropes of this unique design because *it has more steel and fewer voids than any conventional wire rope!* Result: Higher strength . . . Greater flexibility . . . Easier handling . . . Longer life.

Published records prove that this wire rope, when used in applications for which it was designed, reduces operating costs, diminishes downtime and increases profits.

Known as CENTERFIT, an exclusive J&L wire rope, it is laid together in *one* operation. All strands run in the *same* direction. Outside strands fit snugly into valleys between inside strands, eliminating crossing as in conventional designs. *This prevents internal nicking.*

CENTERFIT is recommended for *hoist lines, closing lines, cable controls* on earth moving equipment, and *draglines* when operating on small diameter drums and sheaves.

In addition *only* J&L wire rope is lubricated with BRONZ-LUBE—the lubricant with the high film strength that prevents squeezing out between strands. BRONZ-LUBE contains fine flakes of soft bearing metal providing a smooth wear-resistant bearing surface for every wire—forms close adherent coating that doesn't drip off unless subjected to high temperature.

HERE'S HOW YOU CAN SAVE MONEY ON WIRE ROPE

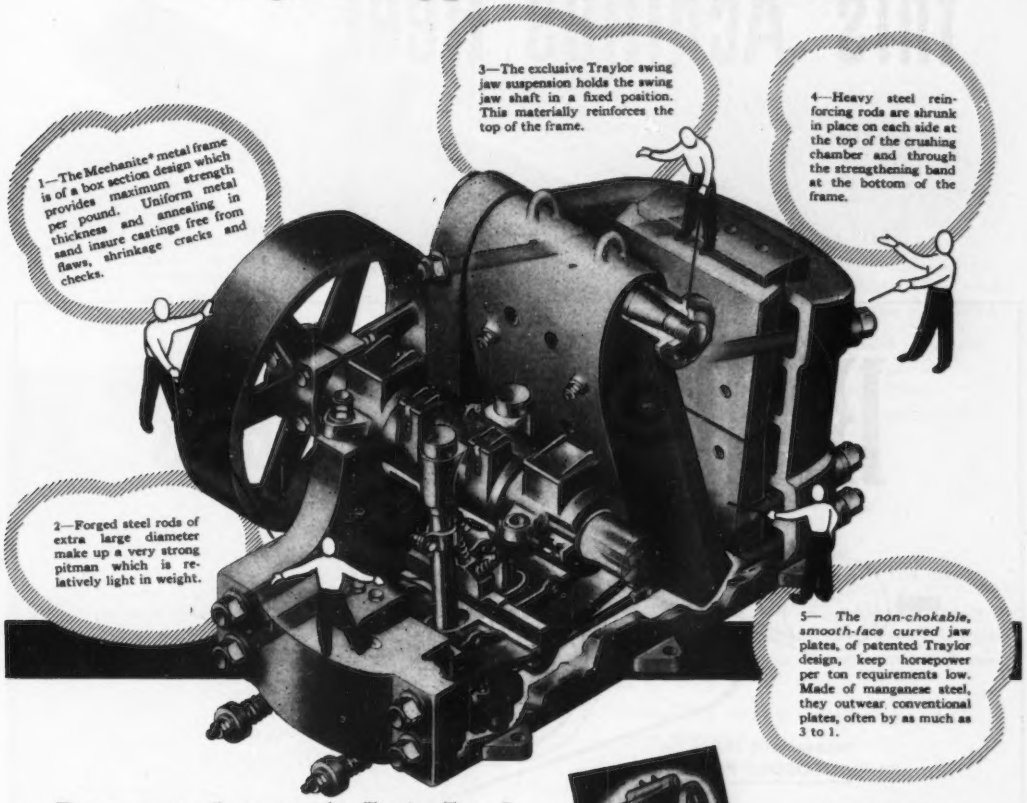
Keep an accurate performance record on your present wire rope on applications mentioned above. When it is worn out, switch to J&L CenterFit and compare its performance with what you are now using. We'll gladly send you a wire rope service card with a plastic holder *free!* Write on your business letterhead to: Jones & Laughlin Steel Corporation, 412 Jones & Laughlin Building, Pittsburgh 30, Pennsylvania.

JONES & LAUGHLIN STEEL CORPORATION

From its own raw materials, J&L *manufactures a full line of carbon steel products, as well as certain products in* OTISCOLOY *and* JALLOY *(hi-tensile steels).*

PRINCIPAL PRODUCTS: HOT ROLLED AND COLD FINISHED BARS AND SHAPES • STRUCTURAL SHAPES • HOT AND COLD ROLLED STRIP AND SHEETS • TUBULAR, WIRE AND TIN MILL PRODUCTS • "PRECISIONBILT" WIRE ROPE • COAL CHEMICALS

"Advanced Design" is written all over a Traylor Type R Jaw Crusher


1—The Mechanite* metal frame is of a box section design which provides maximum strength per pound. Uniform metal thickness and annealing in sand insure castings free from flaws, shrinkage cracks and checks.
2—Forged steel rods of extra large diameter make up a very strong pitman which is relatively light in weight.
3—The exclusive Traylor swing jaw suspension holds the swing jaw shaft in a fixed position. This materially reinforces the top of the frame.
4—Heavy steel reinforcing rods are shrunk in place on each side at the top of the crushing chamber and through the strengthening band at the bottom of the frame.
5— The non-chokable, smooth-face curved jaw plates, of patented Traylor design, keep horsepower per ton requirements low. Made of manganese steel, they outwear conventional plates, often by as much as 3 to 1.

This cut-a-way illustration of a Traylor Type R Jaw Crusher exposes its many advanced design features. Each of these many features contribute to larger profits by increasing production while cutting power and maintenance costs. The Traylor Type R Crusher is a modern breaker of massive proportions and sturdy construction . . . designed for heavy-duty service under the most severe operating conditions. For more complete information on one of the best primary crushers available, mail coupon for free bulletin on a Traylor Type R Jaw Crusher.

MAIL COUPON FOR COMPLETE INFORMATION

TRAYLOR ENGINEERING & MANUFACTURING CO.
304 MILL ST., ALLENTOWN, PA.

I would like to have complete information on Traylor Type R Jaw Crusher.

Name _____

Company _____

Address _____

_____

SALES OFFICES: New York, N.Y.; Chicago, Ill., Los Angeles, Calif.
Canadian Mfrs: Canadian Vickers, Ltd, Montreal, P.Q.

A "TRAYLOR" LEADS TO GREATER PROFITS

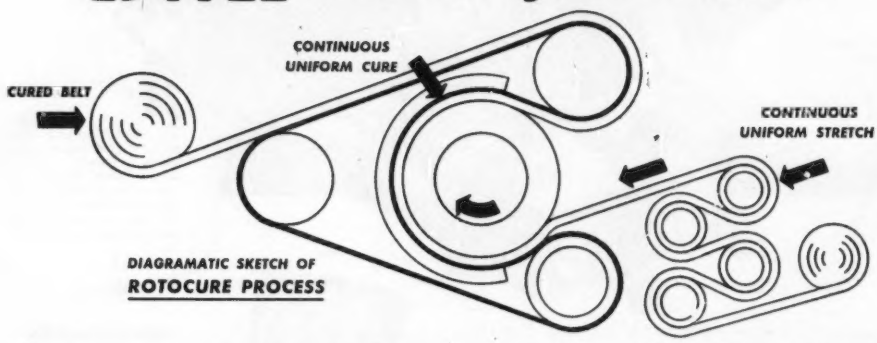
Traylor

Rotary Kilns, Coolers and Dryers · Grinding Mills
Jaw, Reduction and Gyratory Crushers · Crushing Rolls

ROTOCURE Eliminates this "Achilles Heel"*

*Overcured Sections which occur every 30' to 40' are a primary cause of failure in belts made by the flat press method. You won't find these "Achilles Heels" of double vulcanization in BWH Conveyor Belts.

WITH BWH Conveyor Belts



DIAGRAMATIC SKETCH OF **ROTOCURE PROCESS**

Curing a small segment of rubber belting *twice* is unavoidable when belts are made under the conventional flat press method. With this "stop and go" technique, a cured segment is advanced slightly less than a press length. As vulcanization is resumed, an overcured segment results due to overlapping. This twice-cured segment is a critical section or "Achilles Heel" of about 2 to 4 inches in length and the width of the belt. It is responsible for structural weaknesses and excessive surface wear which cause early belt failure and high maintenance costs.

To solve this problem, BWH technologists pioneered the ROTOCURE process of *continuous* vulcanization whereby every *inch* of belting receives the same, *uniform* curing treatment. Here are 4 important reasons why ROTOCURE has paid off for users throughout industry, in installation after installation—by longer service life before replacement.

1. Because there is no double vulcanization, uniform abrasion-resistant covers are always assured.
2. A continuous vulcanization eliminates the overlaps which can reduce flex life up to 40%.
3. Mechanical distortion (inherent with flat press curing at the press ends) is eliminated.
4. Constant uniform stretch results at all times.

As with conveyor belting — so with transmission belting, the BWH ROTOCURE process provides all these advantages plus a higher coefficient of friction because dusting agents are not required in the manufacture with ROTOCURE.

Call in the BWH distributor or write us direct for the full story of ROTOCURE and what it can do for you in keeping conveyor belts working efficiently longer — and holding belting costs down to earth.

Another Quality Product of

BOSTON WOVEN HOSE & RUBBER COMPANY

Distributors in all Principal Cities

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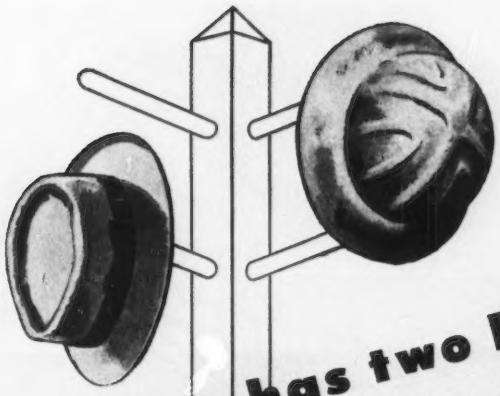
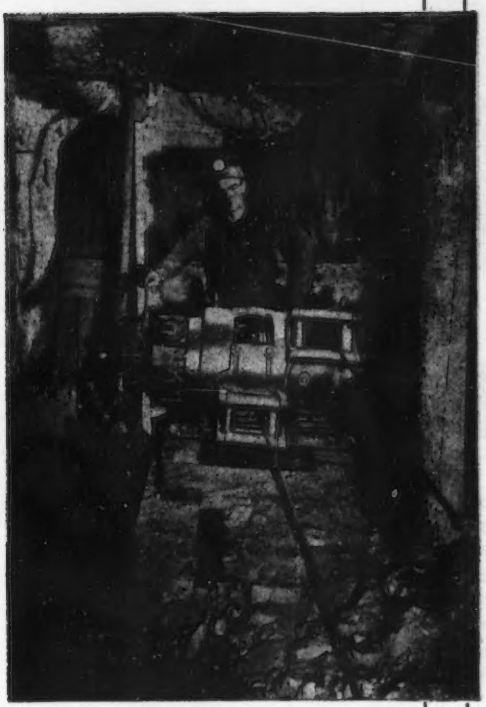
BWH DEPENDABLE RUGGEDNESS



why the man has two hats . . .

He's a Gardner-Denver field engineer—keeps his "hard" hat handy for frequent trips underground—finds out "on-the-spot" just what results you expect from mechanized operations.

That's right, Gardner-Denver field engineers, you'll find, know *your* underground conditions from first-hand experience. That's why Gardner-Denver equipment suits *your* needs so well.



Gardner-Denver Airslusher

in scraper slushing, for example . . .

Production equals load per trip times trips per hour —so Gardner-Denver Airslushers are powered by the famous five cylinder air motor that lugs a full scraper at top speed—develops maximum speed and power in either direction.

- **Finger-tip throttle control never tires the operator.**
- **Free-wheeling clutch needs no adjusting.**
- **Direct drive wastes no air between trips.**
- **Fewer parts—simple, rugged construction.**

Write for full details on these and many other important Airslusher features.

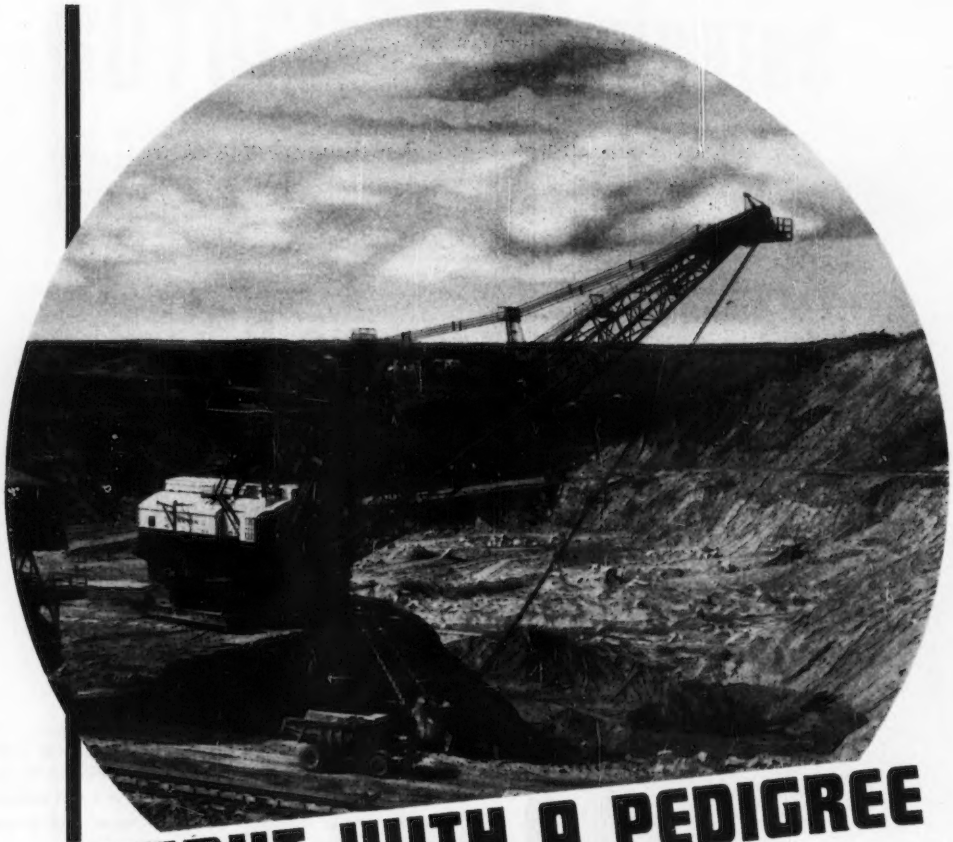
SINCE 1859

GARDNER-DENVER

THE QUALITY LEADER IN COMPRESSORS, PUMPS AND ROCK DRILLS

Gardner-Denver Company, Quincy, Illinois

In Canada:
Gardner-Denver Company (Canada), Ltd., Toronto, Ontario



OUTPUT WITH A PEDIGREE

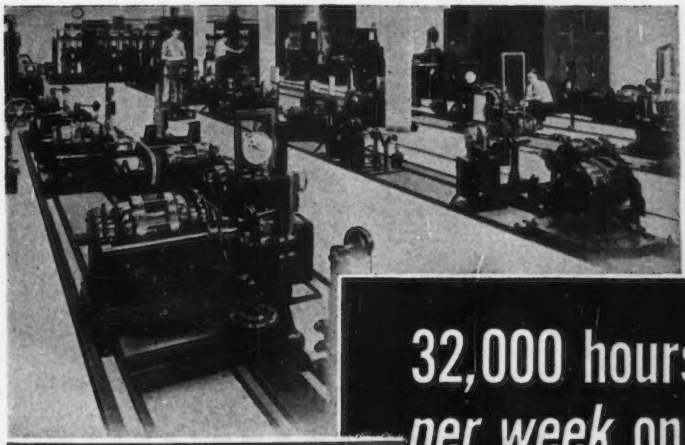
THE big, low-cost output records achieved by Bucyrus-Erie mining shovels are based solidly on a background of unequalled manufacturing experience. Each excavator in this outstanding ⅜ to 30 cubic yard line embodies the principles of design and construction Bucyrus-Erie has gained in building over 75,000 machines of all sizes and types, for work under all conceivable operating conditions in all parts of the world.

This fund of practical knowledge extends to every part of a Bucyrus-Erie . . . from the selection of steels and alloys to the placement of machinery . . . from the selection of power units to the design of caterpillars and boom-point sheaves. The inevitable result is a fast, dependable, smooth-working excavator — correctly adapted to its work requirements, capable of setting peak performance standards now and in years to come.

116LSO

BUCYRUS ERIE

SOUTH MILWAUKEE, WISCONSIN



In the GATES Research Laboratories...

32,000 hours of testing *per week* on V-Belts alone!

In Gates V-Belt testing laboratories, which are by far the largest in the world, we run *32,000 hours of testing per week* on V-Belts alone. Thats' the equivalent of *5 years of continuous service* for one belt—*all in a single week!*

This intensely *Specialized* Research on V-Belts has naturally given Gates Engineers a knowledge of V-Belts and V-Belt drive design that is truly unusual—and it is this specialized knowledge that is embodied in the Gates "GUIDE for SELECTING or DESIGNING V-BELT DRIVES."

Take Advantage of this Great Store of V-Belt Knowledge—FREE!

The GUIDE is widely recognized as the most comprehensive and complete book of its kind—as well as the *easiest to use*—and it is *yours for the asking!*

Another Gates publication, the "INDUSTRIAL NEWS," published monthly, brings you the case histories of actual V-Belt Drives that have been designed and used by practical operating men or by plant engineers—reporting all that is new and progressive in V-Belt drive practice.

Whether you are a practical operating man or a design engineer, you can save much time, hard work and money by having these very useful Gates publications. They are entirely free—are sent to you without the slightest obligation. Just mail the coupon below—today!

Get these TIME, WORK and MONEY SAVING PUBLICATIONS FREE

Gates VULCO ROPE DRIVES

Engineering Offices and Jobber Stocks IN ALL INDUSTRIAL CENTERS of the U. S. and 71 Foreign Countries

THE GATES RUBBER COMPANY

The World's Largest Makers of V-Belts

DENVER, U. S. A.

The Gates Rubber Company
973 So. Broadway, Denver 17, Colorado

I would like you to send me without cost or obligation—

☐ The Gates "GUIDE for SELECTING or DESIGNING V-BELT DRIVES".

☐ Gates "INDUSTRIAL NEWS" published monthly.

Name_____

Position Held_____

Name of firm_____

City_____ State_____

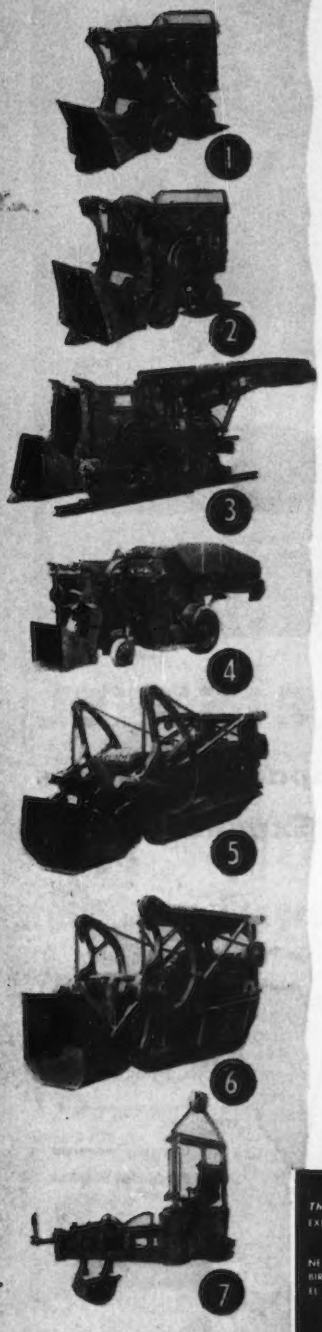
ENG-507

FORGET ABOUT CABLE PULL-OUTS
O-B Terminals are the Strongest Available for Use in Fused Taps
Fastening cable about a binding post may make a good connection for a fused tap, but it takes time. It's a fussy job to form a loop in heavy cable and hold it in place while the post is being tightened. While it will hold most of the time, it just isn't as strong as a fused tap cable connection can be, and those 'once-in-a-while' pullouts usually tie up a lot of production.
Why not simplify matters with a fused tap terminal that really holds on? The O-B Form-H and Form-J Taps have the strongest cable-gripping terminals available for use in fused taps.
The set screw type H-1 terminal and the cam type H-2 terminal cover a range of cable sizes from No. 6 to 2/0, and both can hold tight enough to break the cable rather than let it slip. Fastening the cable to either is an easy job—just slide the bare cable end into the terminal hole and tighten the set screws or hammer the cam into position. Whichever you use, you've got a cable connection that will stay put!
Get away from pullouts and production delays with O-B Form-H and Form-J Taps. They really hold on! Your O-B representative has these taps ready to show you.
4098-M
OB

LOADING ROCK

FASTER . . .

CHEAPER



Tunnel drivers used to estimate 2½ to 3 feet of tunnel width for a man. This rapid calculation told Mr. Tunnel Driver how many men could work with shovels in the face at one time. A good worker could load 1½ cubic yards per hour.

Modern Tunnel drivers estimate the size of their heading for the largest Eimco RockerShovel they can use. They know the capacity of RockerShovels. The smallest (Model 12B) will load 1 cubic yard or more per minute (as much as 45 men).

RockerShovels give the man a longer, stronger arm. He does more work yet he goes home without physical strain.

Eimco tunnel loading equipment is fast, economical and dependable. Air, Electric, Gasoline and Diesel powered models are available. Check with Eimco before buying loading equipment .

1. Model 12B, smallest RockerShovel. Loads 1 to 2 tons per minute. 5'6" headroom required. Bulletin L1010.
2. Model 21, medium size tunnels. Loads 2 to 3 tons per minute. Air or electric power. Bulletin L1011.
3. Model 40, for high speed loading. 3 to 5 tons per minute. Track gauge from 24" to standard railroad. Bulletin L1009.
4. Model 15, transport model. A self-loading truck. Gasoline or electric power. Bulletin L1013.
5. The 102 RockerShovel crawler mounted. 3 to 5 yards per minute. Bulletin L1023.
6. The 104 RockerShovel crawler mounted. 6 to 8 yards per minute. Bulletin L1019.
7. Model 17. The shaft mucker for large shafts. Write for information.

EIMCO

12B

THE EIMCO CORPORATION

The World's Largest Manufacturers of Underground Rock Loading Machines

EXECUTIVE OFFICES AND FACTORIES . . . SALT LAKE CITY 8, UTAH, U. S. A.

BRANCH SALES AND SERVICE OFFICES

NEW YORK: 51-52 SOUTH STREET • CHICAGO: 3319 SOUTH WALLACE STREET
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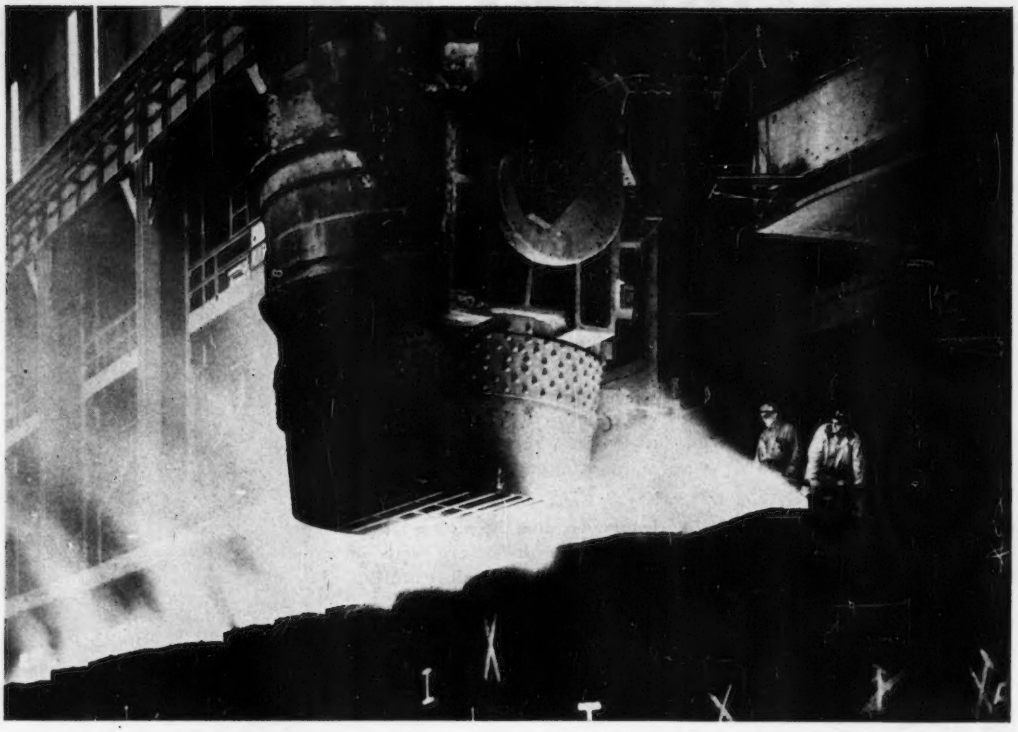
KELLOGG, IDAHO: 315 MAPLE STREET

AFFILIATED COMPANIES: SOCIETE EIMCO, PARIS, FRANCE
EIMCO (GREAT BRITAIN) LTD., LEEDS 12, ENGLAND
AGENTS IN ALL PRINCIPAL CITIES THROUGHOUT THE WORLD



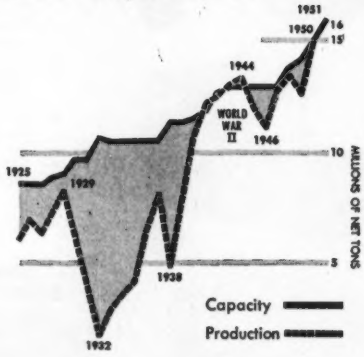
MILLION TONS MORE STEEL

Latest Increase in Bethlehem's Annual Capacity Climaxes 5 Years of Postwar 3,100,000-Ton Expansion

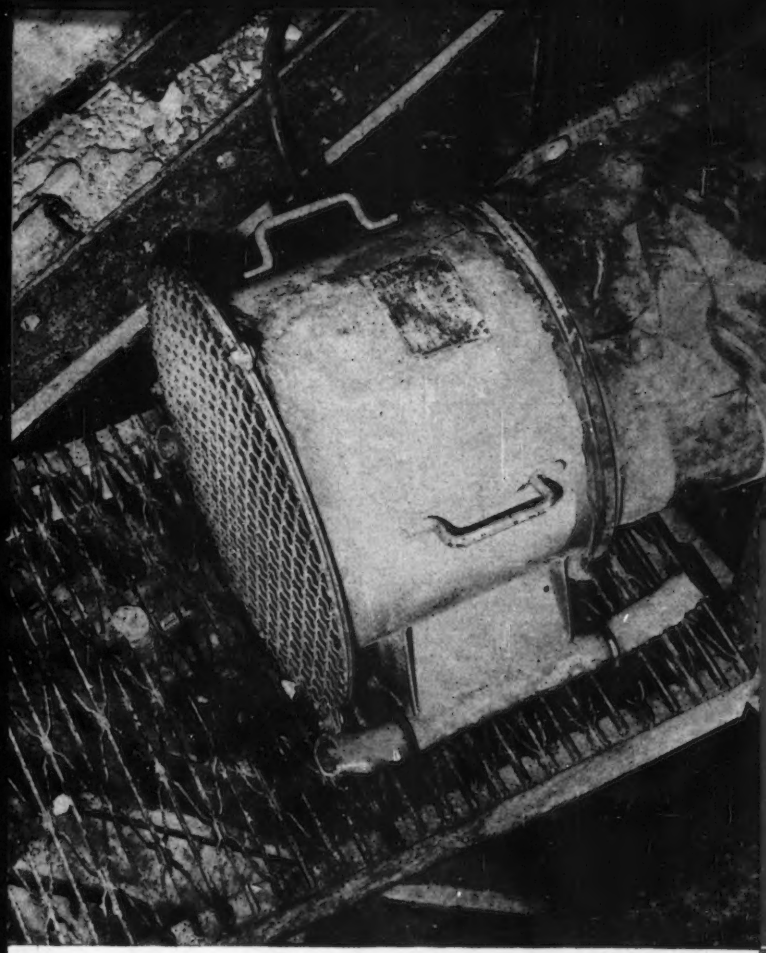
On January 1 of this year Bethlehem's steel making capacity stood at 16 million ingot-tons annually—*an increase of 1 million tons* over a year ago.

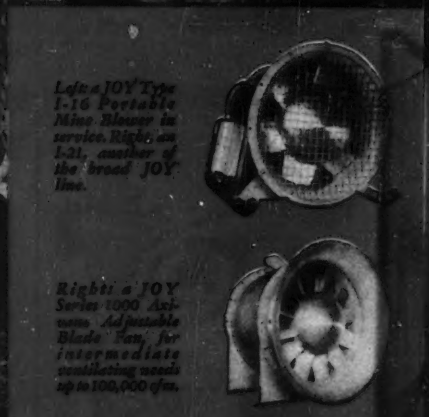
Since the war ended we have increased our annual steelmaking capacity *3,100,000 tons, or 24 per cent.*

Moreover, as the chart at the right shows, Bethlehem's steel capacity has nearly doubled in 25 years. Additional capacity can and will be created as it is needed.



BETHLEHEM STEEL ★ BETHLEHEM STEEL ★





Left: a JOY Type I-16 Portable Mine Blower in service. Right: an I-21, another of the broad JOY line.

Right: a JOY Series 1000 Axivane Adjustable Blade Fan, for intermediate ventilating needs up to 100,000 cfm.

SAVE VENTILATING COSTS

with these all-purpose, two-in-one units

JOY AXIVANE Portable Blowers are setting new records for low-cost ventilation wherever they're installed. Right at the start, their vaneaxial design principle is more compact and efficient, consuming less power for the required volume of air. And even more important, the high efficiency of JOY vaneaxial-type blowers is maintained over a much broader range of pressure than other designs. That means you can operate JOY Blowers economically in either low or high-pressure service—they're equally adaptable for use with short or long runs of tubing. For example, when you want to supply air to a deeper or more remote section of the mine, you no longer need a different type of blower for the new service—JOY AXIVANE Blowers can do the whole job. ● *Call on us for specifications and performance data—ask for Bulletin J-607.*

Consult a Joy Engineer

W & D M3411

JOY

AXIVANE*

PORTABLE BLOWERS

*Reg. U.S. Pat. Off.

JOY MANUFACTURING COMPANY

GENERAL OFFICES: HENRY W. OLIVER BUILDING · PITTSBURGH 22, PA.

IN CANADA: JOY MANUFACTURING COMPANY (CANADA) LIMITED, GALT, ONTARIO

Walworth manufactures a *complete line* of Gate, Globe, Angle, Check, and Lubricated Plug Valves, made of Stainless Steel, Steel, Iron, Bronze, and Special Alloys in a wide range of sizes and temperature-pressure ratings.

Fittings of steel, iron, and bronze are also manufactured in all conventional types and sizes.

WALWORTH

valves and fittings

60 East 42nd Street, New York 17, N. Y.

Distributors in principal centers throughout the world

new Gar Wood DOZERS

FOR *NEW* PRODUCTION RECORDS

These entirely new Gar Wood dozers are perfectly matched for the new Allis-Chalmers HD-9 and HD-15 tractors. Engine-mounted hydraulic dozers have all hydraulic equipment in one compact streamlined "package" mounted over tractor radiator. Both hydraulic and cable dozers have new tilt screw at frame trunnions for easy and quick vertical blade adjustment. They have many other money-making features . . . ask your nearest Gar Wood—Allis-Chalmers dealer.

Matched with NEW ALLIS-CHALMERS HD-15 Tractor

- GAR WOOD Model CD-153 Cable Dozecaster (shown with Model 151 Front Mounted Control Unit)
- GAR WOOD Model CT-153 Cable Tipdozer
- GAR WOOD Model HD-153 Hydraulic Dozecaster
- GAR WOOD Model HT-153 Hydraulic Tipdozer

Matched with NEW ALLIS-CHALMERS HD-9 Tractor

- GAR WOOD Model HT-93 Hydraulic Tipdozer (shown)
- GAR WOOD Model HD-93 Hydraulic Dozecaster

GAR WOOD INDUSTRIES, INC.

Findlay Division • Findlay, Ohio

MANUFACTURERS OF GAR WOOD TRACTOR EQUIPMENT FOR ALLIS-CHALMERS INDUSTRIAL TRACTORS

GAR WOOD GW INDUSTRIES

SEE INSIDE

now TWO MORE

HD-9

WEIGHT: 18,500 lb.
70 DRAWBAR Hp.
GM 4-71 DIESEL ENGINE
SPEEDS: 6 forward, to 5.68 mph.;
3 reverse, to 4.43

ALLIS-CHALMERS

TRACTOR DIVISION • MILWAUKEE 1, U. S. A.

The World's Most Modern Line of Crawler Tractors

Here's
BIG NEWS
for Tractor Users

Completely New Allis-C

NEW POWER RATING

POWER, WEIGHT, BALANCE put them in a class of their own — never such traction . . . such pulling, pushing or lifting ability. And the smooth-operating GM 2-Cycle Diesel engines work without strain under the most extreme conditions.

NEW STRENGTH

All parts are designed and built to carry their loads with a margin of safety. No need to go to a larger tractor just for strength alone. The HD-9 and HD-15 set new standards for tractor quality.

NEW DESIGN SIMPLICITY...

for Easier Control and Greater Operator Comfort— Easy-shift transmission • Self-energizing brakes • Booster steering controls • Adjustable, cushioned seat • Wide arm rests • Convenient controls and pedals • Full visibility • Instant electric starting.

for Simplified Servicing— Unit construction permits removing major assemblies without disturbing companion groups • Extended lubrication periods throughout—1,000 hours on truck wheels, idlers and support rollers.

Complete Line of Matched Equipment, Developed in Cooperation With Allied Manufacturers, Available For Both The HD-9 and HD-15

✔ For Greater Production
✔ For Easier Operation
✔ For Simplified Servicing

OUT AHEAD M se

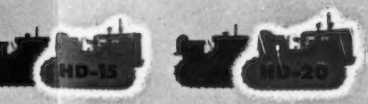
HD-5 HD-9

Chalmers Tractors

HD-15

WEIGHT: 27,500 lb.
102 DRAWBAR Hp.
GM 6-71 DIESEL ENGINE
SPEEDS: 6 forward, to 5.80 mph.;
3 reverse, to 4.51

odern Allis-Chalmers Line
ets New Tractor Standards



Each of these four Allis-Chalmers crawlers gives you a new yardstick for rating tractors. Each brings you a new kind of performance . . . plus new strength, operator comfort and service simplicity. For the finest in crawler tractors, see your Allis-Chalmers dealer.

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Introducing
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NEW ACTORS
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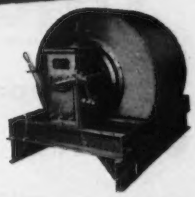
HEADLINERS ON ANY SHOW · ANY WEEK!
Producers
THE BAKER MANUFACTURING COMPANY
SPRINGFIELD, ILLINOIS
Specialists in Hydraulic and Cable-Controlled Earthmoving Equipment for 43 Years

You Can Cut Today's High Production Costs with STURTEVANT EQUIPMENT

AIR SEPARATOR

For separation of fines to 325 mesh and finer. Increases output from 25% to 300% . . . lowers power costs by 50%. For years, this separator has been the standard in the cement industry.



DUSTLESS BLENDER

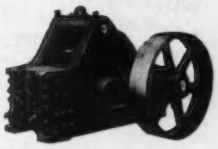
Four-way mixing action assures a thoroughly blended product. Open-door accessibility permits easy cleaning. Available in many mixing capacities for ¼ ton per hour and up.

RING-ROLL MILLS

For medium and fine reduction (10 to 200 mesh), hard or soft materials. Very durable, small power. Operate in closed circuit with Screen or Air Separator. Open-door accessibility. Many sizes. No scrapers, plows, pushers, or shields.

SWING-SLEDGE MILLS

For coarse and medium reduction (1" to 20 mesh). Open-door accessibility. Soft, moderately hard, tough or fibrous substances. Built in several types and many sizes.



JAW CRUSHERS

For coarse, intermediate and fine reduction of hard or soft substances. Heavy or light duty. Cam and Roller action. Special crushers for Ferro-alloys. Several types, many sizes.

Sturtevant equipment, such as illustrated, helps you overcome high labor and production costs by increasing output. In addition, their rugged construction assures long life with minimum maintenance. It will pay you to investigate these machines. Write for information.

STURTEVANT MILL COMPANY

101-A CLAYTON STREET, BOSTON 22, MASS.

MAIL COUPON TODAY!

STURTEVANT MILL COMPANY
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Gentlemen:
Please send me your catalog. I am especially interested in _____

Name _____

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Longer service life at lower final cost

with dependable

CRANE VALVES

No. 1610 Diaphragm Valve. Ask for literature on full line through your Crane Branch or Crane Wholesaler.

CASE HISTORY FROM CRANE FILES

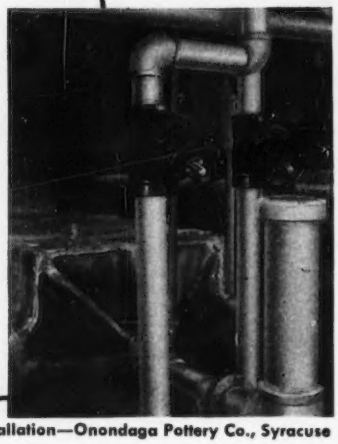
PROBLEM: To find a more efficient and economical replacement for plug cocks having an average life of only 2 to 8 weeks in pipe lines handling liquid clay to filter presses.

WORKING CONDITIONS: Working pressure 140 psi, with liquid clay flow creating highly erosive effect; also corrosive. Strong tendency to clogging. Operating cycles 5 to 6 per day; relatively quick opening and closing required.

SOLUTION: Crane No. 1610 Diaphragm Valves, iron body, packless design, with separate disc and diaphragm.

RESULT: After 11 months' uninterrupted service, Crane valves showed no significant wear or damage resulting from normal operating conditions. User assured of greatly reduced maintenance and replacement costs over plug cocks. No. 1610 Diaphragm valves approved for standardization on all filter press piping.

Another example of the greater value in Crane Quality, and the lower final cost of Crane Valves for every service. That's why . . .
More CRANE VALVES are used than any other make!



The installation—Onondaga Pottery Co., Syracuse

CRANE

CRANE CO., *General Offices:* 836 S. Michigan Ave., Chicago 5, Ill.
Branches and Wholesalers Serving All Industrial Areas

VALVES • FITTINGS • PIPE • PLUMBING • HEATING

LOW-COST HAULAGE HAS PUT

MANCHA'S LITTLE TRAMMERS

UNDERGROUND—ALL OVER THE GLOBE

Durability has kept them there!

MINING MEN MADE HER WHAT SHE IS TODAY. NO WONDER THEY'RE PROUD OF HER! NEVER SAW A "MLT" LIE DOWN ON THE JOB, DID YOU?
MANCHA'S LITTLE TRAMMER
NOPE! SEEN 'EM RIGHT IN THERE PITCHING TWO AND THREE SHIFTS A DAY, FOR 20 YEARS AND MORE, BUT — LOOK HOW THEY'RE BUILT!

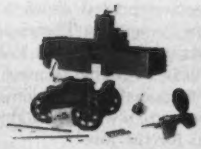
The ideal locomotive for narrow, crooked drifts. Operating weight, 1½ tons.

Toughness—exceptional ability to take punishment—has created a growing world-wide demand for this powerful little storage battery locomotive.

It's a mining man's locomotive—simple in design . . . strongly built—brought to its present high quality through years of study and improvement *at the mine*.

- ***Superefficient:*** **Replacing hand tramming, it sharply accelerates production, at a cost far less, *regardless of wage scales.***
- **Flexible: Hinged cab raises and permits it to be run (under its own power) onto a small mine cage and taken to any level for work.**
- **Economical *maintenance*—assured by rugged construction of parts and unusual accessibility.**

Uses largest possible motor for locomotive of this size. Placed high so water cannot damage it.



Easy! One man, with two wrenches can strip it down like this in about one hour.

Transfer rollers permit battery box to be quickly removed, easily replaced on chassis.

Mail the coupon for illustrated bulletin showing performance charts and complete specifications.

Mancha Storage Battery Locomotive
Division GOODMAN Manufacturing Company
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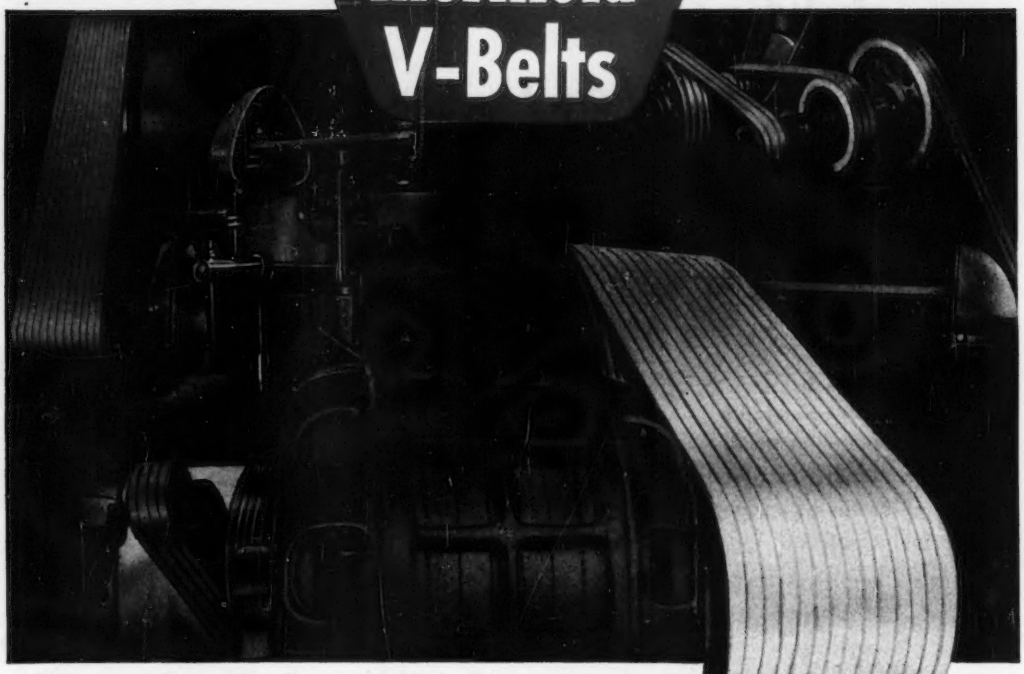
MANCHA'S STORAGE BATTERY LOCOMOTIVE

Division GOODMAN Manufacturing Company
4850 SOUTH HALSTED STREET CHICAGO 9, ILL., U. S. A.

Specify Thermoid V-Belts



Thermoid V-Belts...Built to Last Longer ...Harness Industry's Horsepower!

From the smallest fractional horsepower size to the largest multiple V-Belt . . . Thermoid top-quality serves the needs of every industry. Thermoid V-Belts mean longer-than-average wear, maximum power transmission without slippage and lowest over-all operating costs.

Thermoid V-Belts are specially impregnated to withstand excess moisture . . . abrasion . . . acidity . . . all those elements that hasten belt deterioration. *They are prestretched to insure perfect operation without adjustments.*

For smooth, efficient performance . . . for ability to absorb repeated shock loads . . . for lowest cost per hour . . . specify Thermoid V-Belts. Call your nearest Thermoid Distributor today. He has a complete range of sizes available to meet your requirements. And for your special belt problems, Thermoid Field Representatives are always available to help you select the right belt for the job.

It will pay you to *Specify* Thermoid

Thermoid Quality Products: Transmission Belting • F.H.P. and Multiple V-Belts • Conveyor Belting • Elevator Belting • Wrapped and Molded Hose • Molded Products • Industrial Brake Linings and Friction Materials.

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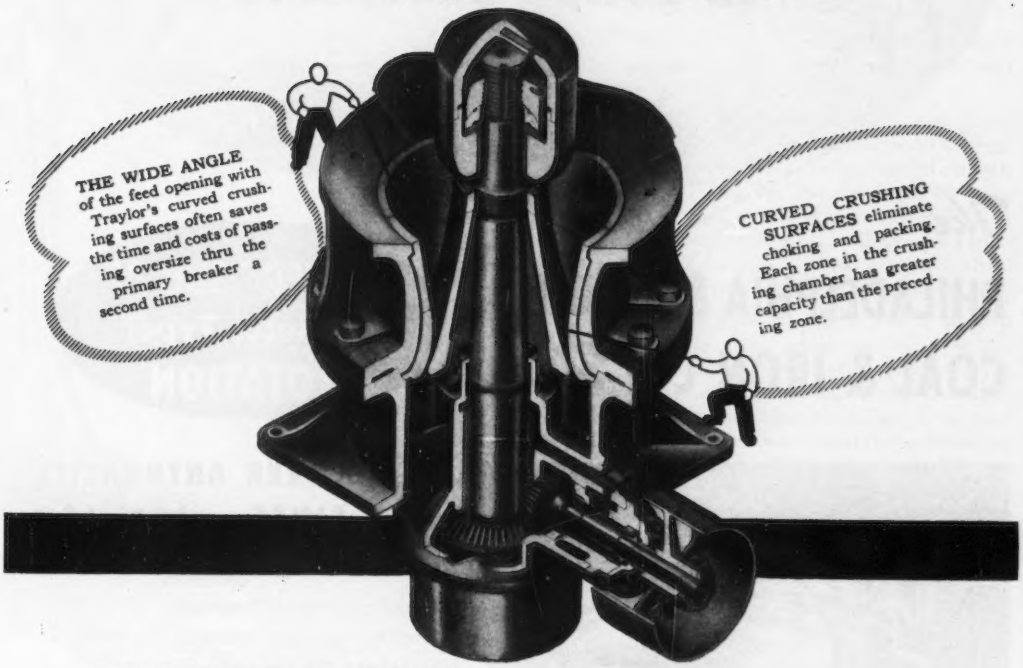
a Traylor TY Reduction Crusher will nip larger rocks than other secondary fine crushers


THE WIDE ANGLE of the feed opening with Traylor's curved crushing surfaces often saves the time and costs of passing oversize thru the primary breaker a second time.
CURVED CRUSHING SURFACES eliminate choking and packing. Each zone in the crushing chamber has greater capacity than the preceding zone.

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By eliminating choking and packing, a Traylor TY Reduction Crusher will increase your plant capacity . . . produce a better, more uniform product with fewer waste fines. By the efficient application of crushing force, Traylor Curved Concaves and Bell Heads reduce power waste . . . and power costs to a minimum. Mail coupon today for free bulletin that gives more complete details . . . sizes . . . capacities . . . of these efficient, economical Traylor TY Reduction Crushers.

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Rotary Kilns, Coolers and Dryers • Grinding Mills
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For More Complete Information . . . Mail Coupon today

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I want to know more about Traylor TY Reduction Crushers.

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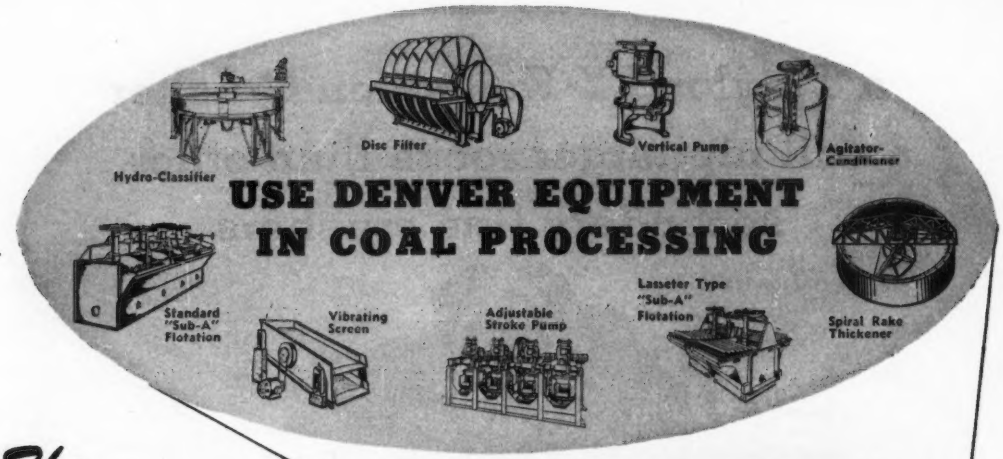
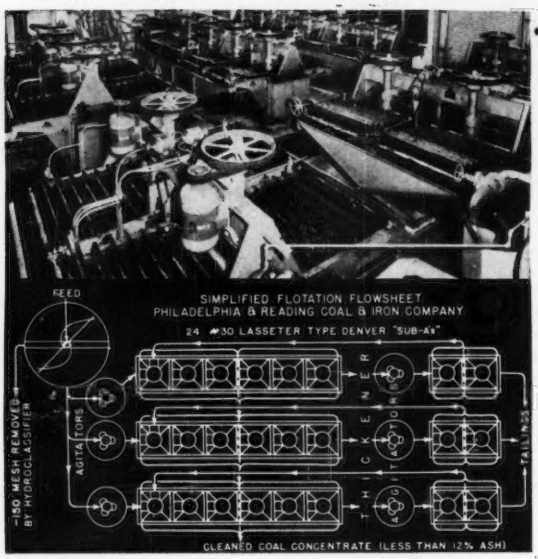
SALES OFFICES: New York, N.Y.; Chicago, Ill., Los Angeles, Calif.
Canadian Mfrs: Canadian Vickers, Ltd, Montreal, P.Q.

A "TRAYLOR" LEADS TO GREATER PROFITS



The PHILADELPHIA & READING COAL & IRON CO. *Uses*

DENVER "SUB-A" (Lasseter Type) FLOTATION



...TO RECOVER ANTHRACITE COAL FINES... LOW ASH CONCENTRATE AT LOW COST

Products: Anthracite Coal Fines.

Particle Size: Minus 10 mesh to plus 200 mesh.

Tonnage: 150 TPH initial feed.

Flotation Cells: 24 No. 30 (Lasseter type) Denver "Sub-A" Cells.

Flotation Feed: Ninety tons per hour (minus 150 mesh removed from original feed).

Flotation Concentrate: Sixty tons per hour. (One ton per minute.)

Ash Content: Less than 12 per cent.

Reagent Cost: Less than 15 cents per ton feed.

Hear this Story AT A. I. M. E.
Read this Story IN DECO TREFOIL

This complete story will be told at the February 1951 A.I.M.E. meeting in St. Louis by Mr. H. R. Hagen of the Philadelphia and Reading Coal and Iron Company . . . and will be printed with details and pictures soon in Deco Trefoil.

Reserve your advance free copy now! Write today.

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"The firm that makes its friends happier, healthier and wealthier"

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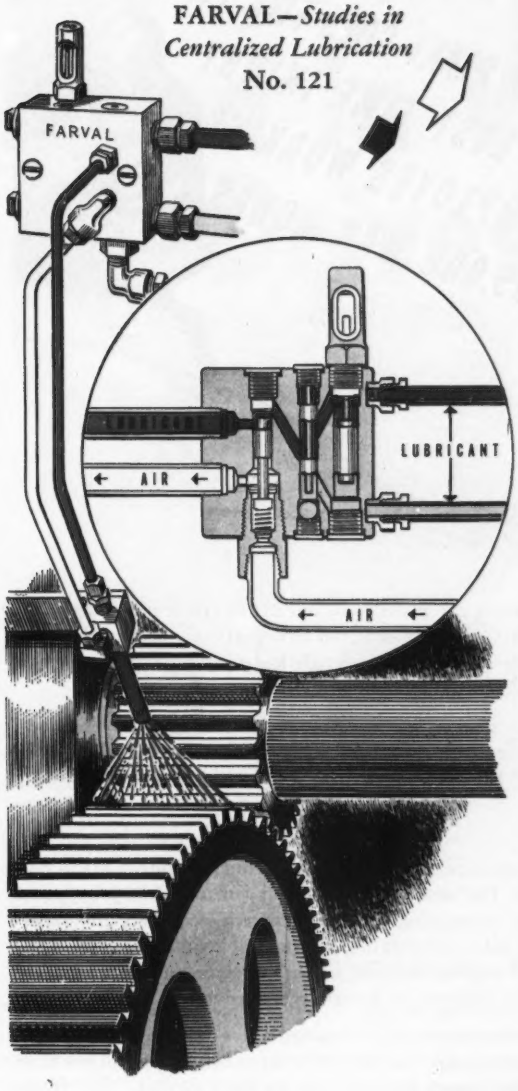
FARVAL—*Studies in Centralized Lubrication* No. 121



New Farval Spray Valve

meters lubricants to slide surfaces and open gearing

CONTROLLED spraying of lubricant on open gearing, slide surfaces, etc., is practical with the new Farval Spray Valve.

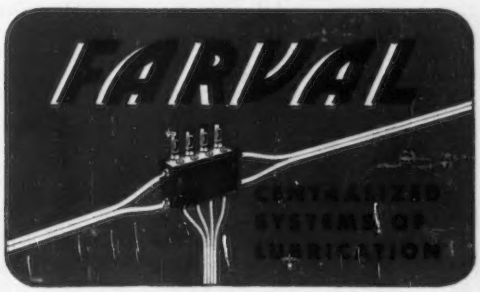
By an ingenious adaptation of the familiar Farval Dualine Valve, either grease or oil is sprayed through a nozzle—on any desired area, in any desired amount, and at any desired interval. The new spray valve can be added at any point in a regular Farval Dualine System where compressed air is available—or a complete system may consist entirely of spray valves, served by either manual or automatic pumping unit.

Compressed air from the supply line is directed through the spray valve, which meters air to the delivery nozzle just as lubricant is metered. By a unique arrangement, the lubricant valve also turns on and shuts off the air. Thus the quantity of air used is limited to the amount needed to spray each delivery of oil or grease, without exhausting or reducing pressure. Positive cut-off of lubricant by the Farval valve after each delivery eliminates bleeding from the nozzle—no waste, no mess, no trouble.

The Farval Spray Valve has been thoroughly tested in service and is now in use on a wide variety of machines and equipment. It has demonstrated its ability to supply lubricant efficiently and economically to open gearing, slide surfaces, in fact, wherever a standard Farval Dualine closed system is not readily adaptable.

Write for a copy of Farval Spray Valve Bulletin No. 60 for a full description, with illustrative diagrams and installation data. The Farval Corporation, 3281 East 80th Street, Cleveland 4, Ohio.

Affiliate of The Cleveland Worm & Gear Company, Industrial Worm Gearing. In Canada: Peacock Brothers Limited.



This Is Really One For The Book!

FEW PEOPLE would expect a blasting cap plant to be one of the safest places to work. Yet Atlas workers, on December 6, 1950, completed five years of making Manasite blasting caps and electric blasting caps without a single lost-time injury! During this period, they produced well over 250,000,000 of these detonators.

The last injury serious enough to send an employe home from work, five years ago, was a wrenched back. The one before that, a bruised ankle. In fact, no lost-time injury has been caused by an explosion in the plant since Atlas converted to Manasite blasting caps and omitted fulminate of mercury as an ingredient in these products some twelve years ago.

Little did anyone realize, then, the new degree of safety which would be made possible in the plant, as well as in the quarries, mines and construction jobs where blasting caps are used. Thanks to pioneering by Atlas research, engineers and experienced production employes, the safety of making and using blasting caps has made a great forward stride. Manasite detonators give greater effectiveness to the safety precautions which must always be followed in handling explosives.

Manasite is typical of Atlas contributions to safer, more effective, and more economical blasting. That's why you can expect to get the *right* answers to blasting problems from Atlas—originator of Manasite detonators and the famous ROCKMASTER "16" Blasting System.

Rockmaster and Manasite: Reg. U. S. Pat. Off.

ATLAS EXPLOSIVES *"Everything for Blasting"*

CHEMICALS ATLAS EXPLOSIVES

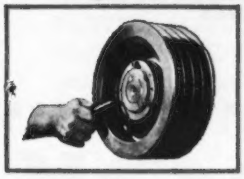
ATLAS POWDER COMPANY, Wilmington, Del. • *Offices in principal cities* • *Cable Address—Atpowco*

Everything You Need in V-Belt Drives!

TEXROPE

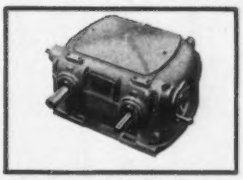
Greatest Name in V-Belt Drives

Made To Order Sheaves — These sheaves made with any number of grooves for A, B, C, D, or E belts, for applications up to 600 hp. Allis-Chalmers own foundry and machine shops equipped to handle work of any size.

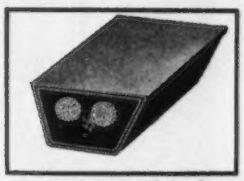


***Magic-Grip* Sheaves** — Fastest mounting sheave you can buy. Aligns easily . . . cannot shake loose. 1 to 12 grooves for A-B, B, C, and D belts. 1 to 250 hp. Stocked in many cities for immediate delivery.

Non-Stock Sheaves—These sheaves are made to order from stock patterns for A, B, C, D, or E belts, 1 to 1000 hp. For further information check with your *Texrope* drive dealer or Allis-Chalmers Sales Office.



***Vari-Pitch* Standard Sheaves** — Speed range of 9% to 28% on drives of 1 to 300 horsepower, using A, B, C, D, or E belts. Two to 10 grooves. These sheaves are available in either motion control or stationary control.



***Texrope Super-7* V-Belt**—Famous grommet construction. No splices where failure can start. Rubber cushion supports rayon cord at pitch line. Sizes and sections to suit all operating conditions. All Standard sizes from stock.

Get Expert Engineering Help

YOU CAN GET every V-belt drive component from the *Texrope* line: constant speed drives; standard and wide range *Vari-Pitch* drives; speed changers; motor bases; and new or replacement, long lasting *Super-7* V-belts.

In addition, you get extra engineering skill both in the field and factory that comes from having more industrial V-belt installations than any other manufacturer.

The world's greatest store of V-belt engineering knowledge has been condensed into a 120 page *Texrope* Pre-Engineered Drive Book. Covers 90% of all V-belt drive requirements. Ask your Allis-Chalmers Authorized Dealer or Sales Office for Bulletin 6956A, or write Allis-Chalmers, Milwaukee 1, Wisconsin.

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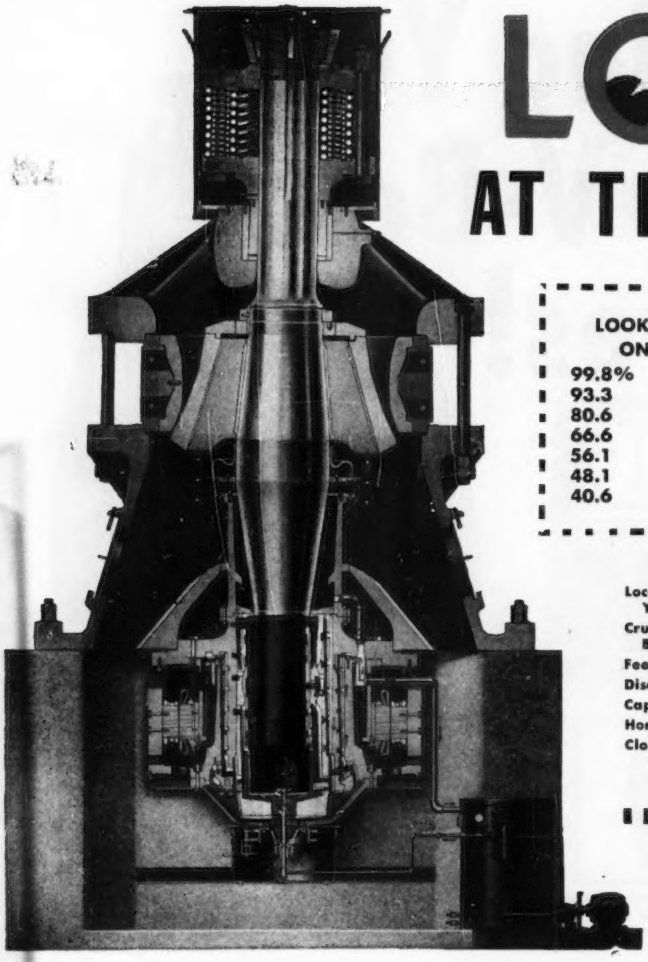
CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

PUMPS — Integral motor and coupled types from ¾ in. to 72 in. discharge and up.

Texrope, Super-7, Vari-Pitch, and *Magic-Grip* are Allis-Chalmers trademarks.

ALLIS-CHALMERS

LOOK AT THIS PROOF!



LOOK AT THESE GRADATION FIGURES ON CLOSED CIRCUIT OPERATION

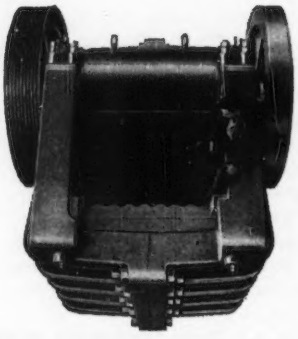
99.8%	Minus	3	MESH
93.3	"	4	"
80.6	"	6	"
66.6	"	8	"
56.1	"	10	"
48.1	"	14	"
40.6	"	20	"

Location: Nationally known Mining Co. in New York State
Crushers: Four No. 37½ Kennedy type "S" Roller Bearing Gyratory Crushers
Feed Opening: 6¼"; Diameter of Head: 3 Feet
Discharge Setting: 7/32" Closed Side at Head
Capacity Each Crusher: 56 Tons Per Hour
Horsepower Each Crusher: 48HP.
Closed Circuit Operation

LOOK

DOUBLE CRUSHING LIFE

Look at POWER SAVING in the "KVS" Swing Jaw Crusher, The STATIONARY jaw now carries 50% of the crushing load. Result—you SAVE POWER in crushing. We looked into MAINTENANCE too. The swing jaw is now ALL IN ONE PIECE, except for the crushing plate. That's removable. Note also—Swing and Stationary jaws are INTERCHANGEABLE, and reversible end for end. Look to that for DOUBLE jaw-crushing life!

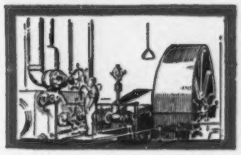


LOOK TO "KVS" FOR PRODUCTS

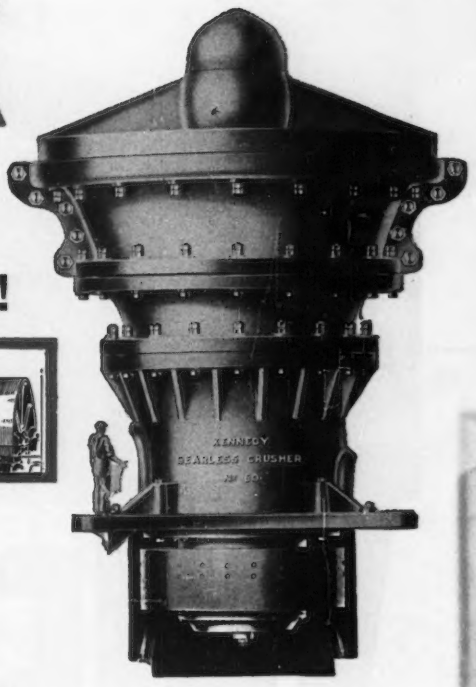
LOOK

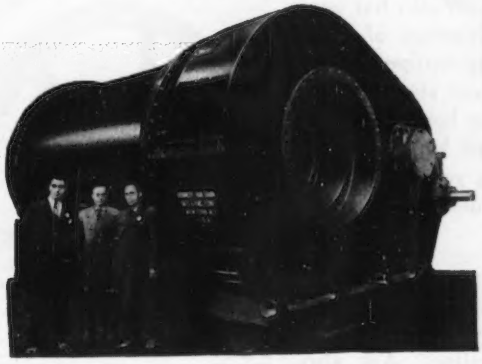
HOW YOU SAVE

BY AN OLD FASHIONED IDEA!



Look at how the big whirling flywheel or pulley of an old Corliss Engine developed KINETIC ENERGY! That meant added FREE power! Look at the BIG Pulley in the "KVS" Gearless, too! It revolves at 3,500 ft. per minute—creates EXTRA crushing power you get for nothing! The 11 ton pulley (used in a "KVS" Gearless Crusher weighing 400,000 lbs.) turns so easily you can turn it with TWO FINGERS! Look here, man—more CRUSHING with LESS POWER, less vibration and less NOISE, too, has put the "KVS" Gearless way out in front and kept it there!





LOOK *and be*

$6,000 *richer!*

Planning to install a tube or ball mill? SAVE up to $6,000 on a "KVS" 10 ft. diameter Mill with integral gear drive by using a SYNCHRONOUS MOTOR DIRECT CONNECTED to driving shaft carried in roller bearings that CANNOT be misaligned or set wrong. Pinion shaft runs at about 600 r.p.m. Pinion shafts in other mills run at about 180 r.p.m. "KVS" trunnions on large sized tube and ball mills CARRIED ON OIL. Bearing never wears out, uses little power. All gears and bearings automatically oil sprayed before mill is started (design pat'd). In 15 years on this type mill no "KVS" gears or pinions have worn out.

LOOK at the "KVS" Bulletins. Fully describe all of above. Just ask for them.

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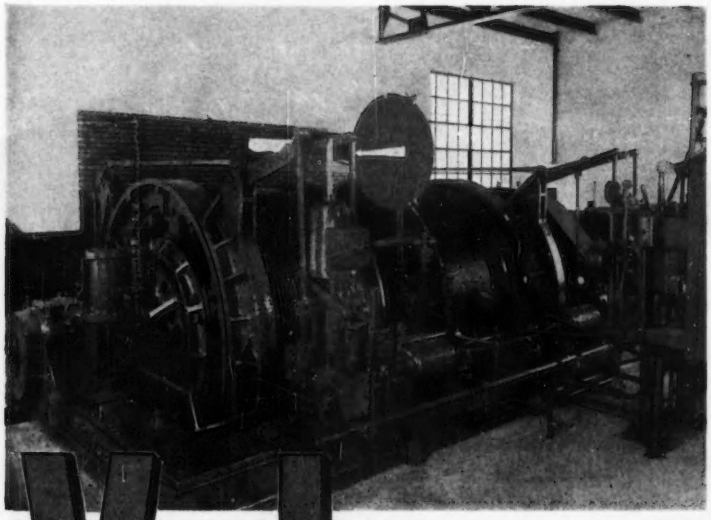

22 Years of Trouble-Free Service And Still Going Strong

Installed at a well-known mining operation in 1928, this 900 hp. double-drum hoist has not only given "Very Satisfactory Service" for more than 22 years but is still, apparently, as good as ever. The cylindrical drums are 9' in diameter by 4'-10" face, grooved for 1⅛" rope. One drum is provided with a positive tooth-type clutch for safe hoisting from different levels, and both drums have parallel-motion post-type brakes. Brake and Clutch engines are air-operated. Vulcan Safety Devices provide dependable protection against any damage that might otherwise be caused by current failure, overspeeding, over-winding or starting in the wrong direction.

Vulcan HOISTS and SHEAVES Are ALWAYS Dependable

For more than a hundred years the Vulcan Iron Works has been building good mine hoists—taking such full advantage of every proved advance in design, materials and accessory equipment that Vulcan Hoists, today, are unsurpassed from every standpoint of Speed, Safety and Operating Convenience. The hoist illustrated and described above embodies only one of the many Vulcan designs that have proved their dependability through long years of trouble-free service and new designs are constantly being developed to meet specific operating conditions.

Correspondence regarding any mine hoisting requirement, no matter how large or how small, is cordially invited. Our experienced engineers welcome opportunities to make money-saving suggestions, whenever possible, without charge or obligation. Ask, also, for Bulletin A-409; its 32 fully-illustrated pages are packed with information regarding all types and sizes of Vulcan Hoists.

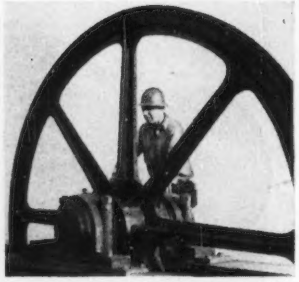

Illustration above shows a Vulcan ALLCASTEEL sheave mounted on self-aligning roller-bearing pillow blocks. Another popular type has tapered roller bearings in the hub and revolves around a dead shaft held in steel clamp-type pedestals. Besides being light and very strong, Vulcan ALLCASTEEL sheaves are so highly resistant to rope wear that NO LINERS ARE NEEDED. Available in a wide range of types and sizes with either plain or anti-friction bearings.

VULCAN IRON WORKS • WILKES-BARRE, PA. U. S. A.

Heavy-Duty Electric Hoists	Shaking-Chute Conveyors	Steam Locomotives	Load-Carrying Larries
Self-Contained Hoists	Chain Conveyors	Diesel Locomotives	Rotary Kilns, Coolers and Dryers
Scraper Hoists	Cast-Steel Sheaves and Gears	geared and electric drive	Briquetting Machines
Car-Spotting Hoists	Cages, Skips and Gunboats	Gasoline Locomotives	Heavy Special Machinery
Room Hoists	Toothed Double-Roll Crushers	geared and electric drive	Open-Hearth Steel Castings

MORE MILES OF MOTION

Homocord CONVEYOR BELTS

Round and round—up and down they go, taking the hard impact of heavy loading . . . and still coming back for more . . .

Users tell us there are more ton-miles of rugged service in Homocord Conveyor Belts than in any other. This is not accidental; we engineered Homocord specially for heavy duty conveying. It cushions load-impact. It troughs naturally, needs less training. It's flexible, yet it's strong.

Bulletin 6906, mailed on request, presents convincing proof.

Our hose, V-belts and flat belts, too, are engineered for extra long life. Ask your R/M Representative.

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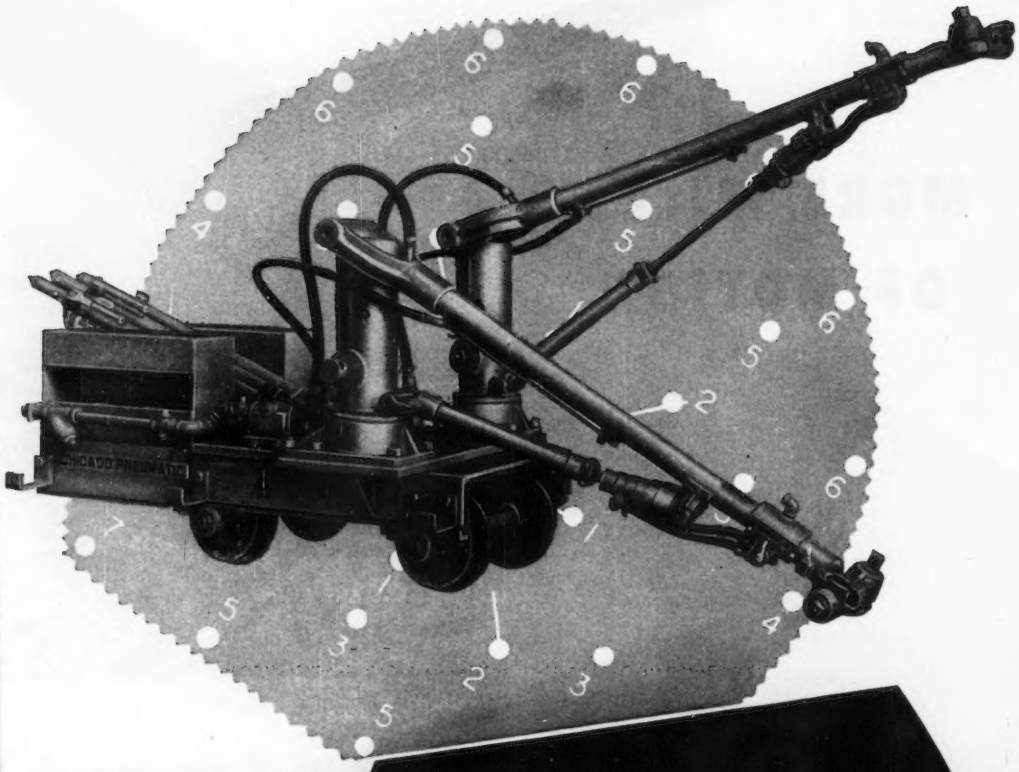
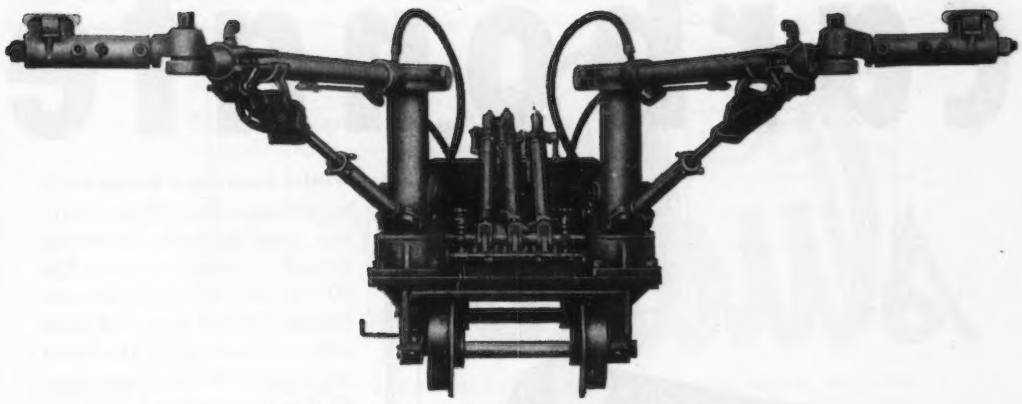


FOR HIGH-SPEED TUNNEL DRIVING

New CP G-600 Air Actuated Drill Jumbo provides maximum speed and efficiency for tunnel driving. Rail-mounted, it is built for all standard track gauges, in single or multiple-boom units.



Front view of Jumbo showing special cross arm construction.

outstanding operating features

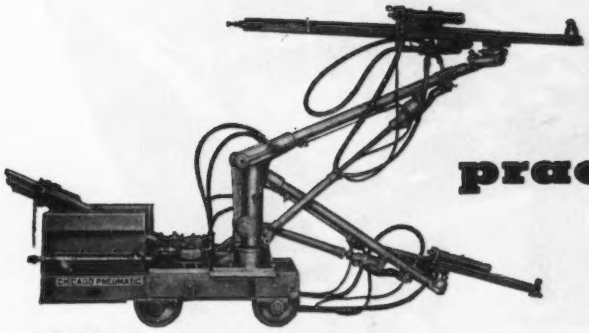
Booms are quickly adjustable to any drilling position.

Vertical adjustments are made by rotary air actuating motor.

Automatic safety locks prevent boom arms from settling.

Control valve of actuator motor is conveniently located at end of boom arm.

Dual valve handles permit operation from either side of boom.



Twin-boom unit with two typical drill mountings for mine headings up to 10′ x 12′. Upper arm has 6-foot chain type feed mounting. Lower arm has 4-foot shell type feed mounting.

practical design

Air to drifter and actuator motor passes through boom, eliminating awkward air hose. Water piping is protected by running under boom arm. Unit is readily disassembled and assembled. Component parts are of sizes easily handled on mine cages. For complete specifications write for copy of SP-3026.

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for carbonate sludge

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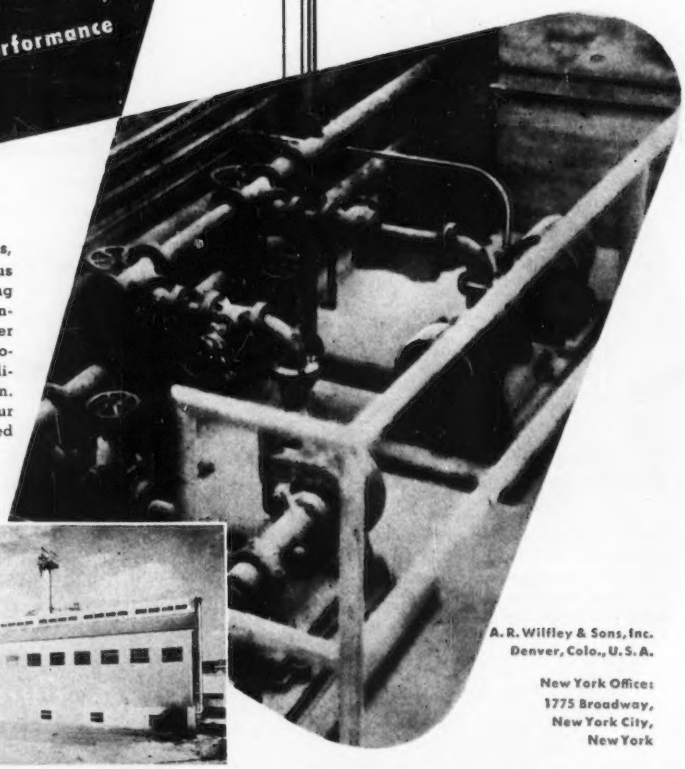
WILFLEY
centrifugal PUMPS
for Cost-Saving Performance

Wilfley Centrifugal Pumps are at work in the City of Miami rotary kiln plant disposing of sludge formed in softening water. The 50 per cent solid calcium carbonate sludge from the wash mill is carried to the thickener tanks and the 20.3 per cent thickener underflow is pumped up to a slurry feeder on the top floor of the kiln feed building. Dependable Wilfley pumps deliver the uniform product necessary for high efficiency operation.



Wilfley Pumps deliver continuous, trouble-free, low-cost performance plus worthwhile power savings in handling sands, slurries or slimes. Complete interchangeability of parts—from rubber to metal, or metal to rubber. An economical size for every purpose. Individual engineering on every application. *Write or wire* for complete details of our new MODEL "K" pumps—engineered for greater pumping economy.

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Denver, Colo., U. S. A.

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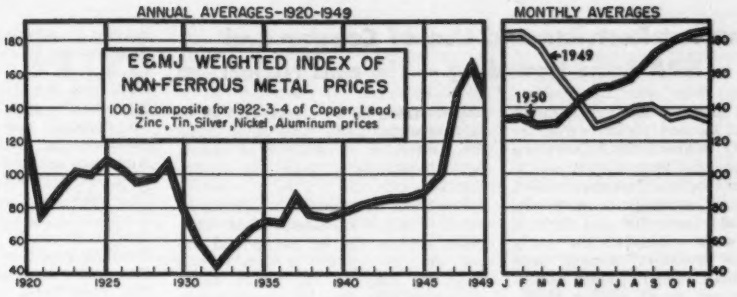
COMPANION TO THE FAMOUS *WILFLEY* ACID PUMP

E&MJ OUTLOOK

PRICES



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MARKETS

Booming "outside" and speculative markets for copper, lead, and zinc wore bigger holes in the price dikes held steadfastly by major producers. The latter in general feel that increases will only bring on Government rollbacks.

The E. & M. J. price index rose to 187.05, a new high, reflecting higher December averages for tin and nickel. International Nickel rolled back its prices on nickel mill products in line with ESA requests, but the December advance in nickel still stood.

●

AT HOME

The final excess profits tax bill reads that Government incentive payments to mines will be exempt from both regular corporate and excess profit taxes. Also it exempts producers of a list of strategic minerals from the excess profit levy.

But watch your step in applying these seeming benefits. There is room in the Act's language for some nimble Treasury interpretation that could nullify much of the intent of the Act.

Look for a good part of the **defense activities affecting mining** to come under Charles Wilson's wing eventually. He'll want it that way.

A Congressional blast at the Munitions Board for slowness in reactivating the old Nicaro Nickel property must give the Board that "You-can't-win!" feeling. However, it does look as though an operator for Nicaro will soon be found.

Washington is negotiating on three big copper projects, two manganese jobs, others on nickel and titanium, reopening magnesium and aluminum plants, studying plans for taconite, and trying to get around to examining dozens of applications for help from smaller mines. It all adds up to big scale developments in mining in the very near future.

●

ABROAD

World-wide shortages of raw materials show up in Washington's decision to ship zinc to Britain that had been earmarked for future shipment to the U. S. stockpile. The British might get 12,000 tons that way this quarter.

Gold is up $1 to $2 an oz. in foreign free markets. However, gold buyers seem to be betting, as is Lloyd's of London, that war isn't imminent, otherwise prices would be higher.

The U. S. will get uranium from the Rand's gold mines, now rated as one of the world's largest sources of uranium, but hitherto disregarded. Four Rand mines are involved so far; West Rand Con., Daggafontein, Blyvoor Gold, and Western Reefs. Capital funds for plants will come jointly from the U. S. and Britain.

MARKETS—Trends and Prices

Government Restricts End Use of Copper and Cobalt — NPA Bans Hoarding — Tin and Nickel Up

THAT THE AUTHORITIES in Washington were in earnest about regulating the economy to check the inflationary price movements became apparent to all concerned before December ended. Controls on strategic materials, chiefly metals, came fast and furious. Meetings were scheduled for early January to "stabilize" copper, lead and zinc prices. The Economic Stabilization Agency issued pricing standards to combat inflation and requested major manufacturing companies to give at least seven days notice before announcing a price increase. Increased attention was directed toward regulating outside participation in marketing metals, both primary and scrap, at higher than established values.

It became illegal to store some 55 commodities in excess of the "reasonable demands of business." The latest inventory control order applies to the demands for business, personal or home consumption and for the purpose of resale at levels in excess of the prevailing market prices. Nonferrous metals and minerals mentioned specifically in the order are aluminum, antimony, asbestos, cadmium, cerium, chromium, cobalt, columbium, copper, industrial diamonds, lead, magnesium, manganese, mica, molybdenum, nickel, platinum, talc, tantalum, tin, tungsten, vanadium, zinc, zircon, and non-ferrous scrap.

Our index of non-ferrous metal prices moved up another notch, from 186.00 in November to 187.05 in December. The rise reflected higher averages for tin and nickel. Domestic quotations named by producers for copper, lead, zinc and aluminum remained unchanged throughout the month. However, the undertone continued strong in all items. Resale or outside metal again sold at substantial premiums. Demand was active, notwithstanding cutbacks scheduled for 1951.

President Truman declared that he would again recommend that Congress remove the 2c. per pound import duty on copper. A move to suspend the duty at the "lame duck" session by amending the excess profits tax was killed Dec. 20.

Effective March 1, NPA banned the use of copper in more than 300 nonessential civilian products. Early in January the agency reduced civilian use of copper by 15% in January and February and by 20% in March. The base period for the cutback is the average monthly use in the first half of 1950.

Apparent consumption of copper, based on statistics of the fabricating division of the industry, amounted to 128,790 tons in November, making the total for the eleven months 1,325,505 tons. During all of 1949 the copper content of products shipped to consumers (apparent consumption) amounted to 1,053,225 tons. Stocks of copper in the hands of fabricators declined in November to 277,590 tons.

Producers delivered 113,715 tons of copper to fabricating plants in November and shipped 10,686 tons to the Government. Stocks of copper in the hands of producers declined to 51,804 tons.

Lead Duty 2⅛c.

Effective Jan. 1, 1951, the import duty on refined lead was restored to 2⅛c. per pound. For a time the trade was concerned over the possibility of an upward adjustment in the domestic price because of willingness by consumers to purchase foreign metal at a premium. The leading importer (A. S. & R. Co.) began offering foreign lead for January shipment at the established New York quotation for domestic metal plus 1½c. The extra charge was for account of the buyer and covered all but five-eighths of a cent of the higher rate of duty. The plan was unpopular and may turn out to be a temporary measure, depending on the imported materials handling program of the Government. The domestic quotation continued at 17c., New York.

Permitted use of zinc for nonessential civilian purposes was reduced by 20%, beginning Jan. 1. Though the price situation was strong, smelters maintained the quotation on Prime Western at 17½c., East St. Louis. Domestic shipments of slab zinc, including metal transferred to the stockpile, totaled 1,145,000 tons

Yearly Average Prices — 1946 - 1950

(E. & M. J. Averages)

	1946	1947	1948	1949	1950
Copper, domestic, f.o.b. refinery	13.820	20.958	22.038	19.202	21.235
Copper, export, f.o.b. refinery	14.791	21.624	22.348	19.421	21.549
Lead, common, New York	8.109	14.673	18.043	15.364	13.296
Lead, common, St. Louis	7.957	14.470	17.843	15.172	13.096
Zinc, Prime Western, St. Louis	8.726	10.500	13.589	12.144	13.866
Tin, Straits, New York	54.544	77.949	99.250	99.336	95.539
Silver, foreign, New York	80.151	71.820	74.361	71.930	74.169
Quicksilver (per flask 76-lb.)	$98.241	$83.742	$76.489	$79.458	$81.258
Antimony, domestic, N. Y. (cases)	17.306	34.852	38.168	40.229	30.906
Platinum, refined	$57.199	$59.087	$86.252	$73.360	$76.556
Cadmium (producers' quotation)	109.022	171.780	182.554	200.000	216.840
Aluminum, 99 plus percent, ingot	15.000	15.000	15.733	17.000	17.713
Magnesium, ingot	20.500	20.500	20.500	20.500	22.043
Nickel, electrolytic	35.000	35.000	36.534	40.000	44.792

Average Prices for December (E&MJ Quotations)

Copper:	
Electrolytic, Domestic, Refinery	24.200
Electrolytic, Export, Refinery	24.425
Lead:	
Common, New York	17.000
Common, St. Louis	16.800
Silver and Sterling Exchange:	
Silver, New York, per oz.	80.000
Silver, London, pence per oz.	70.000
Sterling Exchange, "Checks"	279.925
Zinc:	
Prime Western, East St. Louis	17.500
Tin:	
New York Straits	144.940
New York, 99% min. (e)	143.940
Gold, per oz. U.S. price	$35.000
Quicksilver, per flask	$126.240
Antimony (E&MJ) (d)	35.280
Antimony, bulk, Laredo	32.000
Antimony, in cases, Laredo	32.500
Platinum, refined, per oz.	$90.000
Cadmium (a)	255.000
Cadmium (b)	267.500
Cadmium (c)	280.000
Aluminum, 99% plus, ingot	19.000
Magnesium, ingot	24.500
Nickel (f)	49.500

Domestic quotations, unless otherwise stated, are in cents per pound. Sterling exchange, checks, in cents. Quicksilver, per flask of 76 lb.

(a) Cadmium average based on the producers' quotation.

(b) Cadmium average based on the average of the producers' and platers' quotation.

(c) Cadmium average based on platers' quotation.

(d) Domestic, 5 tons or more but less than carload lot, packed in cases, f.o.b. New York.

(e) Tin contained.

(f) F.o.b. Port Colborne, U. S. duty included.

in 1950, of which smelters here supplied approximately 995,000 tons and importers 150,000 tons. This record movement of metal was insufficient to take care of total demands. Curtailment in use of zinc was put into effect in the United Kingdom. To assist the British in obtaining needed zinc, the United States asked several domestic producers to switch some of their forward stockpiling commitments to the Ministry of Supply. In return, the United States will obtain critical materials for its reserve.

Tin advanced on unfavorable developments in the Far East. Complete control of the metal is in prospect. Complete control of cadmium and cobalt will become effective Feb. 1. Nickel also is in a bad way so far as non-essential civilian uses are concerned. Antimony metal was virtually unobtainable except at premium prices. Imported antimony sold at 40c. per pound.

Tungsten ore was marked up sharply in the foreign market as offerings dried up. Manganese and chrome ores were strong, partly on rising freight and handling charges. Lake Superior iron ore advanced, 60c. per long ton, Lower Lake ports.

(*Continued on page* 92)

Major Metals

U. S. DAILY AND AVERAGE PRICES

	Electrolytic Copper (a) Domestic	(b) Export	Straits Tin New York	Lead New York	Lead St. Louis	Zinc East St. Louis
Dec., 1950						
1	24.200	24.425	136.000	17.000	16.800	17.500
2	No Market	24.425	136.000	17.000	16.800	17.500
4	24.200	24.425	139.000	17.000	16.800	17.500
5	24.200	24.425	139.500	17.000	16.800	17.500
6	24.200	24.425	142.000	17.000	16.800	17.500
7	24.200	24.425	140.000	17.000	16.800	17.500
8	24.200	24.425	141.000	17.000	16.800	17.500
9	No Market	24.425	141.000	17.000	16.800	17.500
11	24.200	24.425	140.000	17.000	16.800	17.500
12	24.200	24.425	139.500	17.000	16.800	17.500
13	24.200	24.425	139.000	17.000	16.800	17.500
14	24.200	24.425	142.000	17.000	16.800	17.500
15	24.200	24.425	146.000	17.000	16.800	17.500
16	No Market	24.425	146.000	17.000	16.800	17.500
18	24.200	24.425	147.000	17.000	16.800	17.500
19	24.200	24.425	155.000	17.000	16.800	17.500
20	24.200	24.425	154.000	17.000	16.800	17.500
21	24.200	24.425	148.500	17.000	16.800	17.500
22	24.200	24.425	150.000	17.000	16.800	17.500
23	No Market	24.425	150.000	17.000	16.800	17.500
25	Holiday	Holiday	Holiday	Holiday	Holiday	Holiday
26	24.200	24.425	150.000	17.000	16.800	17.500
27	24.200	24.425	150.000	17.000	16.800	17.500
28	24.200	24.425	150.000	17.000	16.800	17.500
29	24.200	24.425	151.000	17.000	16.800	17.500
30	No Market	24.425	151.000	17.000	16.800	17.500
AVERAGES FOR MONTH						
Dec.	24.200	24.425	144.940	17.000	16.800	17.500
AVERAGES FOR WEEK						
Dec.						
6	24.200	24.425	138.750	17.000	16.800	17.500
13	24.200	24.425	140.083	17.000	16.800	17.500
20	24.200	24.425	148.333	17.000	16.800	17.500
27	24.200	24.425	149.700	17.000	16.800	17.500
CALENDAR WEEK AVERAGES						
Dec.						
2	24.200	24.425	138.250	17.000	16.800	17.500
9	24.200	24.425	140.417	17.000	16.800	17.500
16	24.200	24.425	142.083	17.000	16.800	17.500
23	24.200	24.425	150.750	17.000	16.800	17.500
30	24.200	24.425	150.400	17.000	16.800	17.500

Silver, Gold and Sterling

DAILY AND AVERAGE PRICES

	Sterling Exchange "Checks"	Silver (c) New York	Silver London	Gold London	Gold (d) United States
Dec., 1950					
1	280.000	80.000	70.000d.	248s.	$35.00
2	(e)	(e)	(e)	(e)	35.00
4	280.000	80.000	70.000d.	248s.	35.00
5	280.000	80.000	70.000d.	248s.	35.00
6	279.875	80.000	70.000d.	248s.	35.00
7	279.750	80.000	70.000d.	248s.	35.00
8	279.750	80.000	70.000d.	248s.	35.00
9	(e)	(e)	(e)	(e)	35.00
11	279.750	80.000	70.000d.	248s.	35.00
12	279.750	80.000	70.000d.	248s.	35.00
13	279.750	80.000	70.000d.	248s.	35.00
14	279.875	80.000	70.000d.	248s.	35.00
15	280.000	80.000	70.000d.	248s.	35.00
16	(e)	(e)	(e)	(e)	35.00
18	280.000	80.000	70.000d.	248s.	35.00
19	280.000	80.000	70.000d.	248s.	35.00
20	280.000	80.000	70.000d.	248s.	35.00
21	280.000	80.000	70.000d.	248s.	35.00
22	280.000	80.000	70.000d.	248s.	35.00
23	(e)	(e)	(e)	(e)	35.00
25	Holiday	Holiday	Holiday	Holiday	Holiday
26	280.000	80.000	Holiday	Holiday	35.00
27	280.000	80.000	70.000d.	248s.	35.00
28	280.000	80.000	70.000d.	248s.	35.00
29	280.000	80.000	70.000d.	248s.	35.00
30	(e)	(e)	(e)	(e)	35.00
AVERAGE FOR MONTH					
Dec.	279.925	80.000	70.000	—	35.00
AVERAGES FOR WEEK					
Dec.					
6	279.975	80.000	—	—	—
13	279.750	80.000	—	—	—
20	279.975	80.000	—	—	—
27	280.000	80.000	—	—	—

Calendar week averages, New York Silver: Dec. 2nd, 80.000; 9th, 80.000; 16th, 80.000; 23rd, 80.000; 30th, 80.000.

(e) No market (Saturday).

THE above quotations for major non-ferrous metals are our appraisal of the important United States markets, based on sales reported by producers and agencies. They are reduced to the basis of cash, New York or St. Louis. All prices, except gold and silver, are in cents per pound.

(a) Net prices at refineries on Atlantic seaboard. To arrive at the delivered New England basis add 0.300c. per pound, the average differential for delivery charges.

(b) Our export quotation for copper reflects prices obtaining in the open market and is based on sales in the foreign market reduced to the f.o.b. refinery equivalent, Atlantic seaboard. On f.a.s. transactions we deduct 0.075c. for lighterage, etc., to arrive at the f.o.b. refinery quotation.

Copper, lead and zinc quotations are based on sales for both prompt and future deliveries; tin quotations are for prompt delivery only.

Quotations for copper are for the ordinary forms of wirebars and ingot bars; cathodes are sold at a discount of 0.125c. to 0.15c. per pound.

Quotations for zinc are for Prime Western brands. Zinc in New York commands a premium over the St. Louis basis equal to the freight differential. Contract prices for High Grade zinc delivered in the East and Middle West during December commanded a premium of 1.10c. per pound over the current market for Prime Western; Special High Grade 1.25c.

Quotations for lead are for common lead. Corroding lead commands a premium of 10 points.

(c) The daily New York silver quotation reported by Handy & Harman is for silver contained in ores and other unrefined silver-bearing materials, in cents and one-eighth cent fractions per troy ounce. It is determined by Handy & Harman on the basis of actual sales of bar silver .999 fine in amounts of 50,000 ounces or more for nearby delivery at New York, and is usually one-quarter cent below the price paid for such bar silver, this deduction being the allowance for carrying, delivering and marketing. In addition to foreign silver, the quotations also apply to domestic and Treasury silver if such silver enters into the New York market.

The Treasury's purchase price of newly mined domestic silver is 90.5c. per troy ounce 1000 fine, effective July 1, 1946. London silver in pence per troy ounce, basis .999 fine.

(d) U. S. Treasury's gold price. Actual payment by the United States Treasury for gold is at 99.75 per cent of the price quoted by the Treasury, which is equal to $34.9125.

Behind the By-Lines . . .

G. P. Lutjen

» **There is a theatre** on 44th St. in New York, where 8 times a week, a dozen chaps in sailor suits take to the stage to proclaim loudly and musically that "There is nothing like a dame!" With practically no reservations we subscribe to that "South Pacific" sentiment, but at the same time we must admit that the fair sex brings a certain amount of turmoil into a man's life. Getting along with the ladies (God bless them!) requires substantial quantities of tact, diplomacy and a vague, supernatural power which, for the lack of a better term, we refer to as "understanding."

The point of this spiel is that the time may be drawing close when your mill, smelter or even your mine may have to substitute womanpower for manpower. Such a substitution is not without its problems. There are some mills operating today, however, that have successfully coped with this situation—not, we may add, without early difficulties. On pages 63 and 67 we offer you a resume of their experience so that you won't have to learn the hard way.

» **From up Noranda** way, we welcome this month a contribution from **R. F. V. Read.** We are particularly pleased to have his article (p. 64) because it lends concrete form to our oft repeated suggestion that extracting information from the technical press can be done without too much strain, and that the potential payoff of such a system is immense. Mr. Read, a newcomer to Canada from the British Isles, is gainfully employed in the engineering office of Noranda Mines.

» **Lithium is attracting** so much attention these days, that before long we may conceivably have a "lithium rush" that compares favorably to our current "uranium rush." In all modesty we can truthfully state that we were personally concerned with lithium way back in the high school chemistry class. Not only did the metal occupy a prominent spot on the periodic table on the wall over the instructor's head so that it caught our eye as we nodded drowsily, but the chemical symbol for lithium coincided with the initials of our girl, a cute, little, blue-eyed ....

As we were saying, lithium is now a big deal. What uranium is to the atom bomb, lithium is to the hydrogen bomb, a new and improved product in the heavy destruction line. Amateur physicists and the morbidly curious can read all about lithium's unsavory relationship to the H-bomb on page 83.

» **Down behind the Felt Building** in Salt Lake City, where Combined Metals Reduction Co. has offices, there is a small corrugated iron shanty labeled "Marquardt Building." Inside you'll find a small but efficient machine shop, a couple of benches full of half-built electrical switchboards, some old vacuum tubes, and **Carl Marquardt.**

Ed Snyder, who runs Combined Metals, installed Mr. Marquardt down there some years ago with instructions to see what he could make out of electronic equipment, or anything else, that would help cut costs of mining or milling. Among other things, Carl has come up with a trolley phone, a shaft communication system, an overwind control and a couple of super-projects so secret as to be designated only by "X" and "Y." It was in this shop, too, that with his assistant, **Maurice Woffinden,** he built the pulp density meter described on page 78.

For the record, Carl started life (professionally) from Michigan Tech as a geophysicist. Being an electronics engineer is better because he gets to sit down more often.

» **Maybe this should go in** the New Products Digest, but we saw it first. The velocity of flowing water is being measured, without introduction of instruments into the stream, by means of ultrasonic sound waves. A transmitter is placed on one side of the water flow and pick-up instruments on the other side, but displaced a known distance along the stream. The phase difference between the transmitted and received sound wave is measured and converted to velocity.

» **A reader speaks:** From time to time we send out an inquiry in the form of a self-addressed postcard to sample readers' opinions on the contents of E&MJ. One was recently returned which expressed no preference but scrawled across it in violent red ink was the message: *"Why worry about mining and milling when politicos are dredging kale out faster than you can put it in your pockets? Let's go fishin' or do sumthin' worth while, like subsidizing angle worms."*

Things must be really ruf.

» **What-Will-They-Think-of-Next Dept.** To keep pancakes off the ceiling and/or floor, a kitchen supply manufacturer has come up with a new thumb-operated stainless steel spatula. The most amateur chef needs only to press a lever and the astonished pancake loops and lands with bombsight accuracy in the pan.

» **A good many readers** recognized the miner's candle holder on the December cover. The gadget could be stabbed into timber or muck pile, or hung overhead.

» **Here's one to pass the time** while waiting to go on shift.

As was the custom in medieval times, a knight crusader on leaving for Palestine, locked his beautiful wife in part armor and entrusted the key to his best friend.

"If I don't return in two years," he said, "give the key to my dear Rosalinda," and so saying, he galloped off to the wars.

Well, our hero hadn't gotten very far from home when he looked back and saw a cloud of dust approaching. Parking his lance, he waited. Soon his trusted friend galloped up, dusty and out of breath, to shout anxiously, "Hey! You left the wrong key!"

ENGINEERING AND MINING JOURNAL

JANUARY, 1951

Manpower Is Vital, Short and Long Term

TO THE MINING INDUSTRY, manpower is not only important; it is crucial, and bids fair to be so for a long time to come.

There are two aspects to the problem, equally important to far-seeing management.

The mining industry is quite generally aware that it faces a manpower problem, and is taking routine, expectable and probably inadequate steps to meet the situation. Many in it may still be unaware that over the next hill—about mid-1951—things will really get tough.

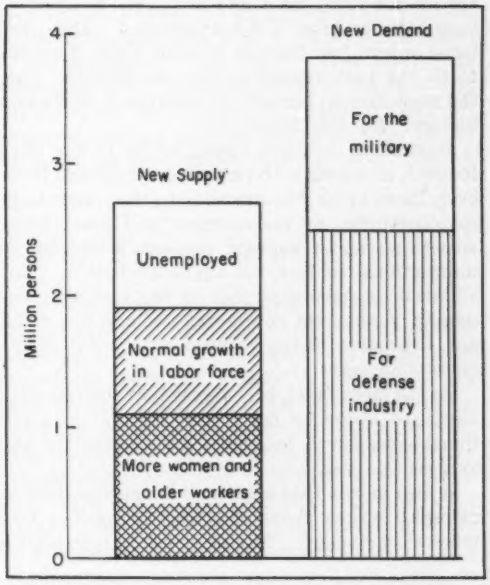
Don't be fooled by evidence of local unemployment resulting from improper meshing of the changeover from a peace to a war footing. Before the Korean affair started, we had what is ordinarily regarded as full employment, meaning that there were from 3 to 5 million unemployed. Since then, material shortages due to frantic purchasing have created local pools of unemployment. Similar results will be felt from credit restraints and the National Production Authority's cutbacks in consumption of critical materials.

To analyze the problem that will loom up in the next few months, McGraw-Hill's Department of Economics made a survey of competent opinion. Charted herewith are the averages of their results—from which no authorities diverge importantly—comparing last September to next June.

In brief, industry in general will have a shortage of more than a million workers. These figures were assembled before the Korean upset. Therefore, they are too conservative to meet the situation dictated by recent events. However, whatever changes are made, the broad conclusion is the same: There is going to be furious competition for desirable manpower and it will be most furious for the kind that in the main mining must have.

To repeat the gist of what we have said before, the operator who looks for regulation by Government to solve his problem is leaning upon a thin reed, indeed. Compulsions upon labor are going to be almost impossible to apply effectively, and if they are invoked, we have little faith in the efficiency of any forced-labor arrangement. This would be particularly true in underground mining with its hazards and necessarily intermittent supervision.

The mining industry must compete for the voluntary efforts of active, intelligent, strong, young men, the very kind that everyone else will want most and into which military demands will make the deepest inroads. It must fight tigerishly to retain the ones it already has, as domiciled men are always preferable to transients. Through its associations and by strong personal efforts, Congress, Selective Service and local draft boards *must* be made to understand the problem. Our spokesmen will not lack for forceful illustrations out of actual experience, as mining *was* dangerously depleted of its manpower during World War II, and men *were* actually taken from the combat forces because the military *did* belatedly recognize that they were cutting a vital artery.



But if history repeats the experience of World War II, we must remember that not more than a third of our industry's manpower losses went to the armed forces. The bulk went to other industries which simply outbid the mining industry for their services. Anticipating that there is no effective way to prevent repetition of this experience through regulation, it seems imperative that mining management must strive as never before to establish premium wages for underground or un-

usually arduous work. There is no sound basis for public criticism of the price levels needed to accomplish this and to relieve Government of the burden of entering into exploration and development. Also, mining management must take a good look at new ways to extend manpower by mechanization, to train men for higher skills, to improve the safety and convenience of working places, to improve living conditions, to deal squarely, to inspire respect and patriotic fervor for the job being done, and to end the destructive feud between labor and management. These are large orders, but there is no alternative if we are to do our part toward saving our children from the most savage, benighted terrorism in all human history. But that is not all.

Most of us will find plenty to do, in the days to come, in coping with immediate problems. However, those of us who are alive to the longer-term responsibilities of management will start doing something about another problem, unrelated to international conflict, but aggravated by it. This situation is impending due to the fact that the crop of youngsters now coming of age is a small one, a product of the reduced birth rates of the depression years.

On the labor front, this means that the remedies discussed above do not merely pertain to a national emergency, but must be adopted for the long pull as well.

It also means that a better job must be done to attract a proper share of bright young men into mineral technology. Mining is a highly technical industry and cannot progress without a progressive technology. Progressive technology cannot be achieved by human left-overs.

Because the mining industry has not met the competition of the more progressive industries in this respect in the past, it faces a harder job now. It not only has to overcome the handicaps that it is relatively unknown and unglamorous, but must live down an established reputation in student circles of being a relatively tough field for a technical graduate to gain recognition and promotion.

We must take a greater interest in what goes on at the schools. We must compete more effectively for promising technical graduates in regard to earnings, training and promotion opportunities. We must help the mineral curricula compete more effectively for the brighter portion of youngsters.

But to the company which perceives its problem, this is no longer enough. Such a company will not be content, things being as they are, with merely general precautions. They will go to the high schools and colleges, establish a liaison with specific youngsters deemed to be promising material, and try to offer the necessary inducements to bring them through desirable college curricula and eventually into their folds. Such programs will call for careful selection of the increasingly rare breed which likes a little hardship, the nomadic life, and far-away places. It will call for education into what a mineral-industry career is like, and possibly counsel, financial assistance, or summer employment. Nevertheless, whatever it takes, we are sure the effort will be rewarding.

Recoup the Resources Involved in Foreign Aid

THE UNITED STATES has come to the point where it is already belated to pose the question, "Can we afford to continue dissipating our depletable resources in foreign aid?"

Our purpose in raising this issue is not to undermine the foreign-aid program, directly or indirectly, but to ask if it is not fair and wise to demand repayment in strategic and critical materials of the equivalent of the mineral raw materials contained in the goods shipped abroad under this program.

It is a moot question whether or not natural resources are the mainspring of national well-being and power. However, it is not debatable, any more, that they are an indispensable factor. It is also not debatable that, insofar as this country's mineral resources are concerned, the cream is rapidly giving out.

Too many people in this country take mineral resources for granted, and act as if they flowed from spigots like a water supply, were replenishable in the same way, and could be turned on and off at will. They have little concept of the difficulty of finding economic deposits or of the impressive combination of skill, labor and equipment necessary to extract the products which enter their warehouses or consumer goods at prices in general far below the cost of renewal from virgin sources.

The resources we have poured into foreign aid are not merely the very substantial amounts of goods whose shipment is financed by ECA. They include the goods not paid for shipped in World War I, the resource contents of Lend-Lease, the military aid program and possibly Point IV. In the aggregate these programs involve a very large resource inventory, gone forever.

This is not to say that civilized progress is endangered by mineral depletion. In broad perspective, we can expect technological improvement and substitution to handle the problem. Also in those few instances where a mineral has no rea-

sonable substitute for a particular use, consumers can pay vastly higher prices, if they must. It all goes back to human effort in the final analysis, and we can well afford a greater investment in depletable raw materials if this is necessary to obtain them. Moreover, under the influence of higher prices, we can be more frugal in use and more careful in reclamation than at present. Nevertheless, the processes of adaptation are slow, as is also the process of exploration and development, and a nation can find itself in a serious position if it is at a comparative disadvantage, particularly during an emergency.

Because our type of economy chews up resources at a fantastic per-capita rate, we are particularly dependent on an abundance of mineral supplies. Our only hope of defending ourselves against a ruthless enemy which now outnumbers us five to one is to continue reinforcing our limited manpower by a prodigal use of resources. We can afford to give the fruits of our labor and talent to our foreign friends. We cannot afford to continue such a lavish outpouring of depletable resources without endangering our own future.

Because of our particular dependence on mineral resources and because the countries that we are helping are in general as well or better off in this respect than we are in comparison to their needs, we think the time has come to require repayment on the terms mentioned above. This subject becomes especially pertinent when it appears that our foreign friends have quite understandable difficulty in making up their minds whether or not to resist the juggernaut in whose path they lie.

How Shall We Answer Our Young Men?

EVEN THE CRUSTIEST CONSERVATIVE must be bewildered today by the changes which events are forcing upon us and by the inadequacy of many of our established concepts in meeting new challenges. Where does the paranoid brutality which seeks our destruction derive its vigor, and why do we find ourselves continually thrust into a rear-guard defensive routine? The Orient is dramatically rejecting Western domination, and tragically so, because we left it to a primeval despotism to offer hope to its downtrodden millions. Europe, the citadel of Western culture, lies trembling at the feet of the aggressor, shaken with doubt that freedom is worth defending. We know that the system we stand for is basically right, but just as obviously we need leadership, moral regeneration, and a revaluation of ideals.

We face a situation where again we shall have to call upon our young men to make great sacrifices to defend, not fringe issues or remote places, but our very existence as a free nation. The young men are asking themselves today, "Why should we accept the discomfort, low pay and great risk of the battlefield, while workers at home demand ever-higher rewards for their efforts, while investors will not risk their capital without a profit, and while all those who remain sheltered at their firesides do nothing to prevent inflation?"

To answer these young men is no easy problem. A pat answer would be "Draft everybody and everything when you draft men for the armed forces. Take all the rewards out of war!" However, while this might meet the moral issue, to regiment the entire country would probably create a dismal failure of productivity. There is no record in human experience to indicate that forced labor can maintain production efforts comparable to those in a well-run incentive economy.

The only way in which a regimented system would be able to function effectively would be to have every individual sufficiently inspired with a sense of duty to the nation and the armed forces, as well as so keenly aware of what the issues mean to him and his, that he will voluntarily make the desired effort and submit cheerfully to regimentation. However, if such individual devotion were more or less universal, the regimentation would be unnecessary. The lads who are asking these embarrassing questions today will not insist on regimentation for its own sake. They simply want to see the spirit of sacrifice more evenly distributed.

To tax all income above a bare subsistence level would be another method of spreading the sacrifices more evenly, but subject to the same doubts about incentives as regimentation.

Only last month and in this issue, we wrote that, judging from experience, the show would not go on if the investor were denied his profit and the worker his premium wage. On the basis of experience, this may very well be true, but we acknowledge that the position offers no inspiration to the young man who is asked to set aside his career and risk his life.

Inevitably we shall have more regimentation than we like and certainly shall have more taxes, but neither to the extent portrayed above. What it will take to give a convincing answer to the young men is leadership that by its fairness and forthrightness will inspire us as individuals to consider sacrifice a privilege; leadership that will not doubt our willingness to serve without being bribed. May the hour of need bring forth such qualities, not only at the top but from our own ranks!

DRILLING OF IRON ORE in trackless panels of Tennessee Coal, Iron and Railroad Co.'s iron mines, in Birmingham district, Alabama, is being done with rubber-tired jumbos of type shown. Two 3-in. machines are drilling center-cut holes of 34-hole double-vee round used. Note roof bolts in back, also those in back in picture opposite.

Trackless Mining Succeeds in

Costs are lower, productivity higher with trackless equipment, as iron ore company shifts to new methods

PRODUCTION OF IRON ORE by underground trackless methods and equipment already has an important place in the mining operations of the Tennessee Coal, Iron & Railroad Co. on Red Mountain, in the Birmingham District, Alabama. Areas for this type of mining are being opened up in practically every one of the company's eight operating mines. Currently, trackless mining accounts for approximately 30% of the iron ore output of this United States Steel subsidiary. The tonnage so mined is definitely expected to increase under a continuance of the mechanization program that has been in effect since February, 1947. The necessary equipment is being provided as rapidly as possible. The objective is full mechanization with trackless units.

In applying trackless equipment and practice to metal mining, the Tennessee company has been ahead of the rest of the mining industry. It maintains the leadership in this respect that it exhibited in the early Nineteen Twenties, when it already had developed underground scraping, or slushing, and put it in operation as standard practice on a scale then unknown elsewhere in the mining industry (scraping a distance of 200 ft. with scrapers weighing a ton, handled by 50-hp. and 75-hp. motors).

The spur to making a change-over to a trackless panel mining system from the company's long-established practice of room-and-pillar mining[1] is found in the benefits anticipated and in part already realized. When the new program was initiated in 1947, the opinion prevailed that, with a greater degree of mechanization, the tons per man would increase, direct mine costs would be reduced, and the overall efficiency would be improved. Today, material benefits

[1]The room-and-pillar practice still accounts for the bulk of the company's current production of iron ore, and under it no extensive robbing of the pillars is likely to be made for some years to come. From 45% to 60% of the ore is taken on the "first mining," depending on the thickness of the cover. The practice was well described by A. W. Beck and E. H. Ball, in E&MJ for September and October, 1937. The description then given of the use of drag scrapers and track-mounted development units is still adequate in essential features.

ORE IS LOADED into rubber-tired shuttle cars in the trackless panels with crawler-mounted machines after being drilled and blasted. Five loaders of type shown are already in use, each served by two cars. Twelve additional loaders and 24 shuttle cars are expected to be in commission soon. Note clearance afforded by use of roof bolting.

Heavy, Abrasive Iron Ore

are already being enjoyed. Trackless mining is giving direct mining costs that are about 12% lower in panel mining than those previously obtained and 20% less in development mining. The approximate 14 tons per (producing) man-shift has been boosted to 23 tons. Accidents are fewer, and ventilation is better, with better control. The trackless sections are also said to show a better grade of ore, owing to a lessening of the dilution caused by waste rock sloughing or breaking from the roof.

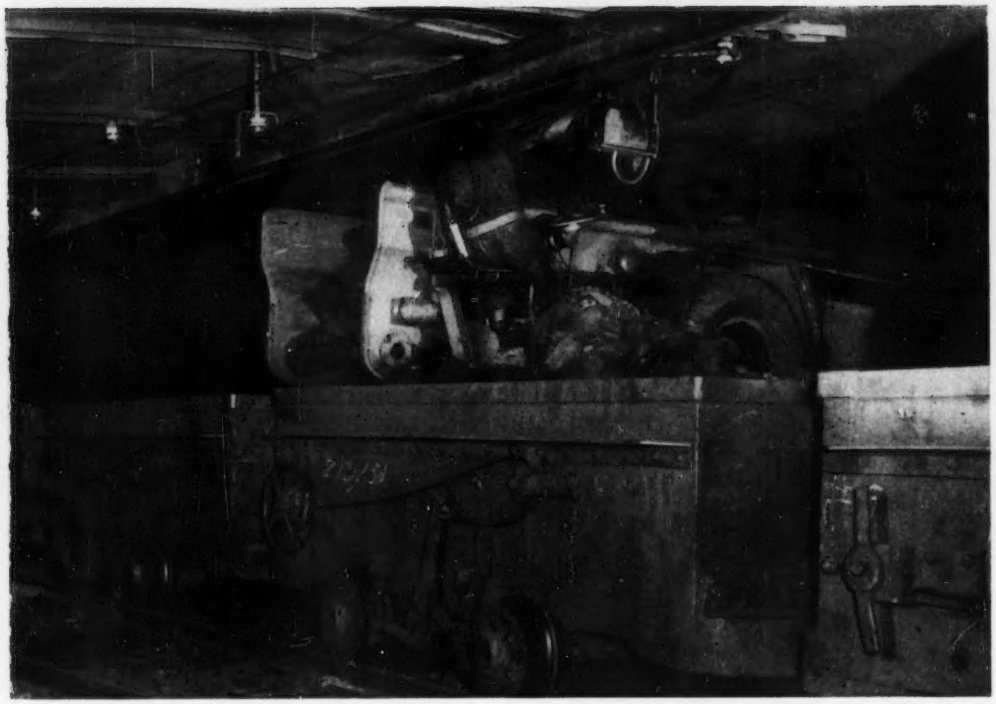
A mine layout different from that used for room-and-pillar mining is necessary where trackless panel mining is to be used. As adopted for the mechanization program in the Tennessee company's mines it calls for four-entry main haulages, three-entry panels, and rooms 22 ft. wide and 300 to 500 ft. long. Average grade in haulages is about 4½% against the load and the rooms in the panel are laid out to keep the grades from exceeding 7% in favor of the load. Variation in dip of the seam makes it impossible to hold to uniform grades and to turn the rooms off at right angles to the panel haulage. To ascertain the best possible grade, diamond drilling is done in the development headings.

Pillar sizes and crosscut intervals have varied in working out the present mining plan. Haulages are now driven on 100-ft. crosscut centers and 30-ft. pillar widths instead of the 150-ft. centers and 50-ft. widths formerly used. Recent experience in robbing in the panels indicates that a pillar width of 26 ft. and crosscuts 60 ft. c. to. c. are preferable to the 50-ft. pillar width with 110-ft. crosscut centers used before. This makes it possible to get 60% of the ore on "first mining" with a safety factor of 3.0, and 80% on robbing with 1.5 as safety factor. This factor depends on the ore's crushing strength (13,000 psi) and the weight of cover.

A Loader Is Developed

Success with trackless mining hinges on the efficient operation of the mining cycle. In the T. C. I. company's ore mines this comprises drilling, blasting, loading, ground support. Close supervision is needed if there is to be abundant broken ore to load when the loading part of the cycle starts. Here the proper functioning of the loader is of prime importance. In turn, this depends on the loader design and maintenance.

With the experimental installa-



LOADED SHUTTLE CAR, after ascending ramp to get above 6-ton mine cars waiting in entry, is discharging its ore. The operator is spotting a mine car by remote control. When loaded, cars will be hauled to rotary dump at slope.

tion by the company of its first crawler-mounted loader, in the No. 11 mine, in February, 1947, the need for modifications and improvement of design began to be apparent. The first loader was of the type having two rotating arms for gathering and pushing the ore onto an integrally-built conveyor which delivers it to a car behind, in this case a shuttle car. It was different from other loaders of the same type, used in coal mining, in that it had been strengthened to handle the heavier and more abrasive iron ore. It was not strong enough, however, and a new model resulted, followed by a third in 1949, of which three were built. This brought the number of loaders installed by December, 1950, up to five. All are electrically operated.

Compared with the original loader, the last three are much more ruggedly built and cost less to maintain. They have a wider gathering head, better arms and clutches, and separate motors for driving the conveyor. The crawler frame is longer, the shoes are wider and heavier, and each crawler has its own control. The conveyor chains also are heavier and each has its own motor, which is of higher torque than before. Gathering-arm discs have heavier bearings and supports, and the arms are driven with heavier chains. In overall dimensions these loaders are 25 ft. 8¼ in. long, 6 ft. 6½ in. wide and 5 ft. 5½ in. high.

In addition to the five loaders now in service in the Tennessee company's ore mines, 12 others have been purchased which are expected to be in operation soon. The 12 new loaders will be distributed to six different mines of the eight the company has in operation. To serve each of the new loaders, two new shuttle cars and other equipment necessary for a unit operation are also being supplied.

Loader Delay Time vs. Loading Performance

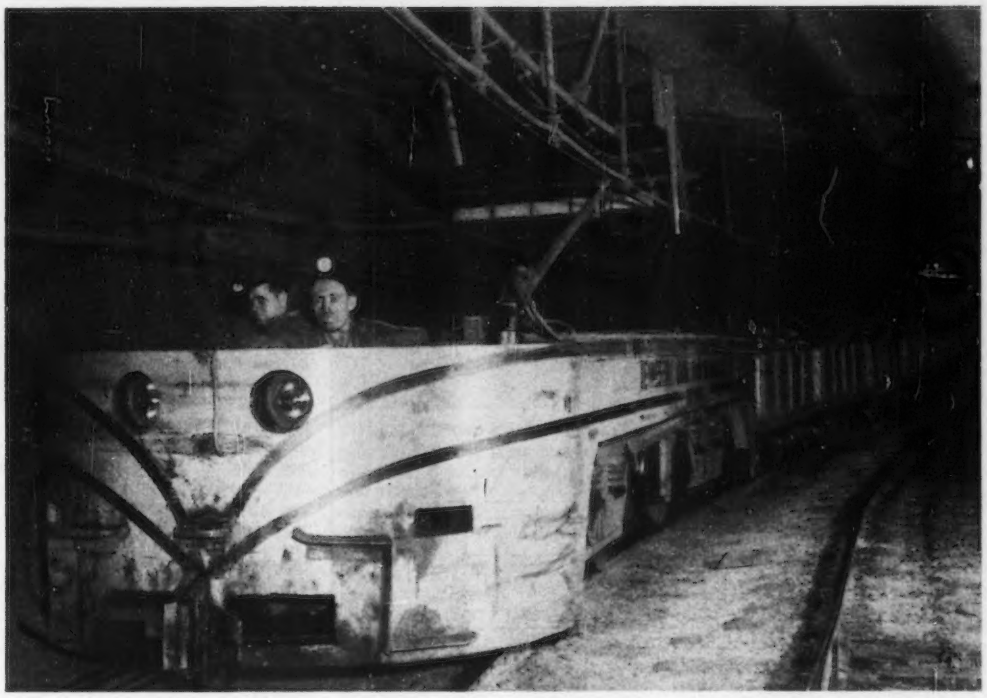
(Loading capacity 8 to 10 tons per minute)

Time lost per week due to delays, 12 months, 1949	9.0 hr.
Time lost per week due to delays, first half, 1950	7.6 hr.
Tonnage averaged per shift, panel loaders, 12 months, 1949	425
Tonnage averaged per shift, panel loaders, first half, 1950	502
Tonnage averaged per shift, loaders robbing, first half, 1950	514
Highest weekly average tonnage per shift by a loader	748
Highest tonnage for one shift by a loader	920

Cut in Delays Helps Tonnage

With improved loader design, the time lost by delays has decreased, as shown in the accompanying tabulation, this in turn improving the average tonnage loaded per shift by the panel loaders and by loaders engaged in robbing. Inasmuch as the number of maintenance men has recently been increased, delay time should continue to decrease and loading performance to improve.

T. C. I. has also been testing a loader of the shovel type, acquired some months ago, which throws its bucket load "over its back" into the shuttle car behind it. This loader is 13 ft. 8 in. long, 5 ft. 10 in. wide, and 5 ft. 3 in. high. It is credited



ONE OF 32-TON LOCOMOTIVES used for hauling ore received from shuttle cars to pocket at slope. The cars in this train have 8 wheels and hold 10 tons each. Eleven such locomotives are in service and six on order.

with a loading rate of 5 to 6 tons per minute.

Ore from the trackless loader is delivered by the loader's boom conveyor to a shuttle car of approximately 14 tons capacity. This car, in turn, delivers the ore to one of a string of 10-ton (or 6-ton) mine cars in the haulageway. These cars, in trains of four or five each, are hauled by 20- and 32-ton trolley locomotives to the pocket area at the foot of the slope (in No. 11 mine, for example). From here the ore goes by 15-ton skips to the surface. Ten shuttle cars are in use—two for each of the five loaders—and 24 more have been ordered.

The shuttle cars are 24 ft. long, 8 ft. wide and 4½ ft. high. They are equipped with a cable reel and 300 ft. of cable. Driven from the rear wheels and steered hydraulically through the front wheel, they have a travel speed of 2 mph., loaded, and 3 mph., empty. They clear the road by 12 in. The conveyor in the bottom of the shuttle car, which serves for shifting the ore forward as it is received in the rear end from the loader boom and for unloading the ore into the mine car, has a speed of 55 fpm. Like the loaders, these cars are built to resist the wearing action of the heavy abrasive iron ore. The driving motors are 10-hp. Ordinarily a loader is served by two shuttle cars.

To effect the delivery of the ore to the mine cars by the shuttle car, a timber ramp of 3x12-in. plank is generally used at the unloading point. The cars are shifted as needed, either by locomotive or by remote control hoists. Where the seam is too thin to give the headroom needed for a ramp with a shuttle car upon it, an elevating conveyor may be used. Two are on hand and three more on order.

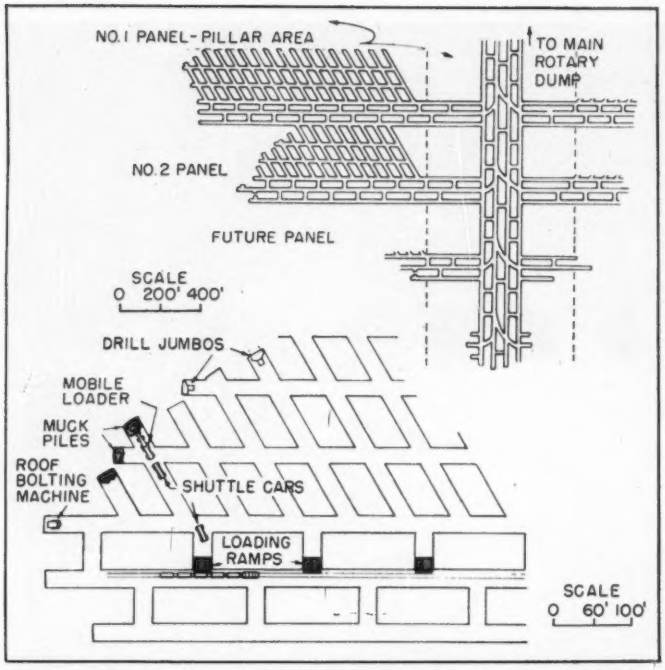
The 10-ton steel mine car in use has 8 wheels, or two trucks of 4 wheels each, and safety couplings. It has a rigid body. Each car is dumped at the pocket by a rotary dump without being detached from the train. Six-ton four-wheel cars were formerly used. Some are still in service. Eventually all will be replaced.

The 32-ton trolley locomotive in use is probably among the largest made for underground haulage. Eleven of them are in service and six more on order. The locomotive runs on 250 v., d.c.

A piece of accessory equipment that is important in the trackless mining operation is the bulldozer. As on surface, its uses are numerous. In particular, it can speed up grading, help keep travel ways smooth, and aid in loading by pushing scattered ore into heaps. T. C. I. has two in service, converted in its shops and weighing 10,000 lb. An interesting feature is the electric operation. Originally a standard unit, each has a 35-hp. motor and a reel with 500 ft. of cable. The weight, 10,000 lb., is considered somewhat too light. Three are on order that will weigh 13,250 lb. Overall dimensions will be: blade length, 7 ft. 2½ in., height 5 ft. ⅝ in., length 12 ft., and width 7 ft. 2½ in.

Breaking the Ore

Consideration of the drilling and blasting operations in the trackless panels has been deferred until now because of the key importance of loading in the mining cycle. For drilling, the Tennessee company is using rubber-tired, air-driven jum-



THE TRACKLESS PANEL SYSTEM of mining which is being substituted for room-and-pillar mining is illustrated by these drawings. Above is the layout of an area for several panels. Below is seen, on larger scale, the layout used for one loader and two shuttle cars.

bos which mount, on movable arms, two 3-in. cylinder machines having a 6-ft. chain feed, as standard equipment. Some jumbos that are crawler-mounted but otherwise like the others are also in service. The drills are positioned by hydraulic means. Neither type of jumbo requires wedging against the back. The weight of the rubber-tired jumbo can be taken off the tires by means of jacks. This jumbo is 22 ft. long, 8 ft. 1 in. wide, and has a 4-ft. wheelbase. It will work to a height of 10 to 12 ft. and over a width of 20 to 22 ft.

Two such jumbos are used in each panel section. On the average, 2.7 faces are drilled and blasted per shift. The 34-hole double-vee, or wedge-cut, round which has been developed in practice is used, giving an average advance per blast of 6½ ft. In the first half of 1950, with this round 192 tons was broken per blast, on the average.

The 6-ft. chain feed requires only two lengths of steel—7 ft. and 12 ft. Of the several types of steel, with and without bits, tested in the trackless areas, the best results to date have come from 1⅛-in. alloy steel having bits forged on the end with carbide-insert tips. In ore a 4-point carbide insert is used. A rod life of over 1,500 ft. of hole is being obtained, the bit being dressed every 500 ft. Drilling speeds in iron ore with this equipment have exceeded 30 in. per minute.

The practice of using roof bolting, or pinning, to support the roof instead of using timbering has spread through all the company's mines since it was started 30 months ago. It is employed in the trackless areas as elsewhere. Much testing has led to standardization of the practice. The standard bolt is of 1-in. round rivet steel and has a 6-in. burned slot for the steel wedge and 5 in. of cut thread. The hole drilled for it in the roof is 1¼ in. in diameter. The wedge itself is 6 in. long and ⅝ in. by ⅞ in. wide in cross section.

Bolt lengths vary from 5 to 8 ft., according to the character of the roof as shown by a diamond-drill hole put in every 500 ft. of advance. An 8x8x½-in. bearing plate is used for each bolt, the hole being 1⅛ in. round for vertical bolts and properly elongated for bolts driven at 60° and used with a suitable angle washer. For holding cracked ground, 5-in. channels 14 to 20 ft. long and having the bolt holes already punched are employed to increase the bearing surface.

Holes in the roof for the bolts are drilled and the bolts are driven and tightened from the lift platform of an air-propelled, crawler-mounted vehicle. The platform is raised by hydraulic means. Six such units, converted from the timber-lifting machine formerly employed, are in use. Ten others, which have been designed specifically for such work, are on order.

For the most part the bolt holes are drilled 5 ft. apart. Each bolt is supposed to be driven 20 sec. and tightened to give 400-450 ft. lb. of torque. The bolts put in place just before blasting are within 2 ft. or closer to the face. Each time a new row of bolts is driven, the crew is required to check the preceding five rows for tightness.

Advantages claimed for roof bolting are numerous. They include: Increased tonnage, greater safety, elimination of laborious timbering and "quarrying," also of resetting timber; greater clearance overhead, decreased resistance to air flow, a lower direct timbering cost, and improvement in the grade of ore mined by keeping waste out of the ore loaded.

The improved ventilation effected in the trackless areas in the T. C. I. company mines comes about because each panel is on a separate split of some 25,000-30,000 cfm., which is directed through the panel. Auxiliary fans also supply air through flexible tubing to each working face. Dust is minimized by spraying water at critical points and using a hose and spray nozzle at each working face.

Training a Factor

Soon after it initiated its mechanization program in 1947, the Tennessee company's management organized a team to aid in training employees to operate and maintain the equipment required, especially the men employed in new sections. This team itself is trained intensively and, in turn, works constantly to train men for new units and to improve units already in operation. Paralleling this effort, a handbook for instruction in mechanical mining has also been prepared by the engineering and operating staff, as an aid in training foremen and head miners. This educational effort has been an important factor in the success of trackless mining at the mines considered.

GERTRUDE B. SOWARD, of Miami, Ariz., has full responsibility of operating a ball mill and classifier unit. She is regulating water valve on classifier (above), and inspecting density indicating instrument (below).

THELMA OWENS, of Miami, Ariz., cuts pulp sample from the discharge dam of a flotation machine (above), and takes another sample from the classifier overflow in the primary grinding section (below).

HELEN McNAIR, of Globe, Ariz., pours out a sample to dry (above), and cleans a pulverizer (below). Jobs such as these requiring meticulous attention have been handled very capably by women employees.

How Women Can Help in Mills

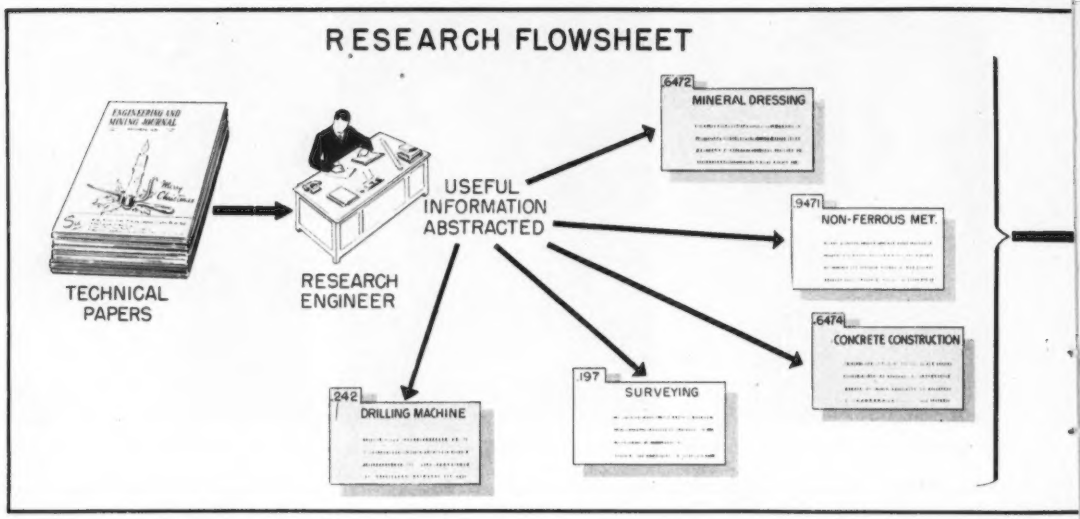
DURING THE CRITICAL manpower shortage of World War II, women performed a wide variety of jobs in mills and smelters, and in the words of one mill superintendent, "The company was darn glad to have them." They contributed substantially to the country's metal production by filling these jobs, and without their help much of the production would simply have been lost. Since the war, most of the women have returned to their homes or taken up other occupations. However, a number are still doing good work at plants in various districts.

Inasmuch as another manpower shortage seems to be shaping up, this is an opportune time to give some consideration to the possibility of employing women for certain jobs.

To give you some idea of the type of work performed by women in the mills, the employees at the mill of the Castle Dome Copper Co., Inc., shown here, have kindly consented to demonstrate their work. The photographs were taken while the women were performing their routine jobs.

At the peak of operations during the war this plant hired 55 women doing 155 types of jobs. Now 7 women are working in the plant—1 ball-mill operator, 1 sweeper, and 5 in the sampling department. Most of these women have been with the company for more than 5 years which speaks well of their ability.

In a companion article, *E&MJ* discusses the various aspects of employing women in mining, milling, and smelting operations. This is based on broad general discussions with many men in supervisory or managerial capacities, and their comments are not related to the above pictorial presentation.



Is Neglected Research Costing

R. F. V. READ
Noranda Mines, Ltd.
Noranda, Quebec

YOU CAN DEVELOP better engineers, create a top notch file of useful information and utilize the talent of a hundred engineers not on your payroll by converting a member of the engineering staff into at least a part-time research man. His work can make your research department a continuous source of new ideas and techniques for all your operating departments.

One of the keys to a successful research department is a good system of extracting knowledge in a useful form from the sources available to the mining industry.

The industry is fortunate in having an excellent technical press which performs a valuable service in disseminating new ideas and information on mining, mineral dressing and metallurgy. This service is particularly important in view of the comparative isolation of the major operating fields.

Effectiveness of this service depends on the use made of it by the engineer on the job. His problem is that only a portion of the articles printed each month are relevant to his immediate task, but in order to determine which, he must look carefully at them all. This problem can be solved by employing someone to abstract, classify and file brief notes, facts and figures from the technical press each month. Then the busy supervisor, desiring information upon a particular subject, would only have to glance at the notes on a few filing cards. When necessary, he could quickly supplement these notes by reference to the original articles.

One man, preferably a recently graduated engineer, could do the job with a typewriter and a small filing cabinet, working for an hour or two each day. Cost of such a note-filing system would be almost negligible in comparison with these advantages gained.

1. Notes are classified by bringing together related items from different journals and different issues. Knowledge does not consist of a mere accumulation of facts, but rather in seeing the significant relationships between facts. Thus are ideas generated. Good use of a note-filing system will, in time, provide the company with a tremendous backlog of useful information on every aspect of its work.

2. An engineer engaged in abstracting and classifying technical notes will improve his ability as an engineer. In fact it is a good idea for every engineer to spend at least a few months upon such work. Most graduates in the mining industry concentrate on obtaining practical experience, during which they often neglect to improve, or even to keep up, their technical knowledge.

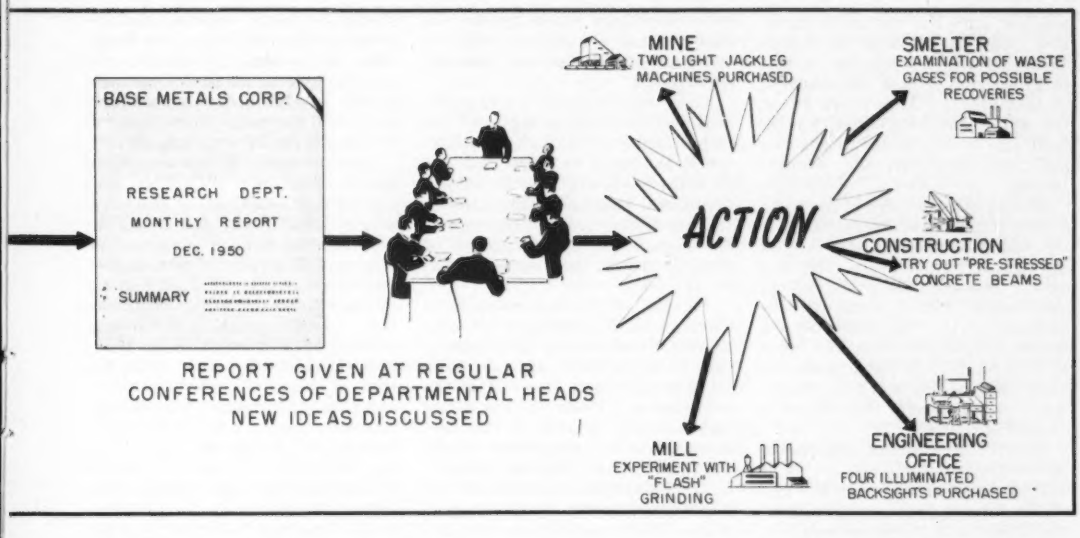
3. Journals studied each month would be retained for reference and so can be made the nucleus of a company technical library, consisting of journals, books and trade catalogues.

4. A further advantage lies in the fact that the company is tapping and using the talent of the thousands of engineers whose work is described in the technical press. In itself the company can afford to keep only a few engineers, but a system similar to the one here described can immediately utilize research done throughout the industry.

How to Handle Notes

The requirements for a good note filing system are: (a) Any particular item must quickly be found whenever it is wanted, (b) It must be flexible so the items can be rearranged for any particular line of inquiry, (c) It must be extendable so that new items can easily be added.

These requirements could be satisfied by keeping the notes upon cards about five inches by eight inches in size, kept in a small filing cabinet. Such cards are small enough to be easily filed and yet large enough to permit photographs



You Money?

or graphs to be attached by staples, while the placing of each major item upon a separate card makes the system both flexible and extendable.

In classifying notes one of the best systems available at present is the Dewey Universal Decimal System,[1] which is employed by many research organizations and libraries. It is a complex system, but a single adaptation of it can be made for use on a company level. In this system all knowledge is divided first into ten classes and numbered, as follows:—

.0 General Works
.1 Philosophy
.2 Religion
.3 Social Sciences
.4 Philology
.5 Pure Science
.6 Useful Arts
.7 Fine Arts. Recreation
.8 Literature
.9 History

Each of these classes is then divided into ten sub-classes, and again numbered, this time using the second place of decimals. For example Group .6 could be divided thus:—

.6 Useful Arts (or Applied Science)
.61 Geology, Prospecting, Sampling.
.62 Mining Engineering.
.63 Construction.
.64 Electrical Engineering.
.65 Power. Plant Mechanical Engineering.
.66 Metallurgy.
.67 Mineral Dressing.
.68 Transport. Communications.

Each of these ten sub-classes is further divided into ten sub-sub-classes, this time numbering to the third place of decimals. For example, the classification for Mining Engineering might be something like this:—

.62 Mining Engineering
.621 Development and Shaftsinking.
.622 Underground Mining Methods.
.623 Ground Support.
.624 Rockdrilling.
.625 Undeground Blasting.
.626 Loading, Transport. Hoisting.
.627 Drainage Ventilating. Auxiliary Underground Equipment.
.628 Open-Pit Mining and Excavating.
.629 Placer Mining.

Each of these is again divided into sub-sub-sub-classes and so on. In short, each item is a logical particularization of the one it succeeds; one more example might clarify this:—

.6 Useful Arts (or Applied Science)
.62 Mining Engineering.
.624 Rockdrilling.
.624.2 Percussion Drilling.
.624.22 Percussion Drilling Bits.
.624.222 Carbide-Tipped Percussion Drilling Bits.

Note that it is unnecessary to completely fill each group upon first starting the system, better that the system be worked out as it grows in practice.

Where applicable, cross-references may be used to underline factual relationships, such as that between drilling shanks, which is a mining item, and the hardening of steel, which is a metallurgical item. These cross-references are of special importance since a single card may often contain subject matter of potential value from more than one point of view.

Technique of Note-Filing

No hard and fast rules can be given for the taking of notes, and much will have to be left to the discretion of the engineer. He should bear in mind that facts should be given greater weight than opinion, and that in the general article the following information is of importance:

Title, Reference and Author
Subject.
Object.
Conclusions.
Data and method, if of sufficient importance.

It is perhaps a good idea only to make marginal notes in pencil upon the first reading of a journal, the actual abstracting can more easily and more efficiently be carried out upon a second reading. At first sight this would appear to involve a great deal of work, but in

[1] "Decimal Classification and Relative Index," by Melville Dewey. Published by Forrest Press, Inc., New York, 1942 (14th Edition).

practice, once the system is organized and the operator is experienced, he will very quickly be able to grasp and to note the essential of each article. As a rough guide, the writer has found that it takes from one to two hours to abstract and file notes on the average journal.

Getting optimum use of clear and conscientious notes abstracted from the technical press is the task of the research department. But just as the manager faces the job of coordinating other auxiliary departments (i.e., transport, repair, stores, personnel) with the work of the production department, so must he gear the work of the research department to the company's over-all activities.

Work of the research department is advisory, not operative. It is difficult to coordinate with the rest of the company because of a deep-seated tendency in human nature to regard suggestion and advice as criticism or interference. However, just as department heads seek aid from auxiliary departments, so should they be encouraged to welcome reports of the research department.

These reports could, for example, consist of a monthly digest of the technical literature that is applicable to the mine or plant, and also of reports on any specific subject of interest to only one department. It is up to the research engineer to find convincing, dynamic ways of putting across the results of his work.

All this will be of no avail, however, unless the manager provides a regular channel for new ideas to pass from the research to the operating departments. New ideas can be a source of profit, but not unless they are put to work. The first essential is to bring them to the attention of the relevant authorities. This could be done by the research engineer reading a report of his findings at regular meetings of departmental heads, where worthwhile ideas could be discussed. The engineer's report should be short, concise, and be given in terms of dollars and cents; that is, he should estimate the economies to be made, the cost and extent of necessary preparatory work, and the main advantages and disadvantages of each scheme.

The principle of the note-filing system is not new, its use has long been found beneficial by many research institutions, and it can be a stimulating help to the industrial concern. The crux of the matter was stated by Mr. F. G. Hill in his Presidential Address to the Chemical, Metallurgical and Mining Society of South Africa in 1948: "Operating heads cannot make the best of plans for production because of insufficient information, but cannot acquire the information because of insufficient time. . . . An industrial concern, if it wishes to have that most desirable of attributes—the scientific approach—must encourage and use research, and must keep in touch with all research activities which may throw light on its problems."

What Mining Officials Think About Women Workers

If your company plans to employ women to meet the pending manpower shortage, read the suggestions offered here by experienced employers. This article is based upon numerous confidential interviews with company officials who have employed women workers during World War II in Western operations, and upon a study of earlier articles on this subject.

PERHAPS the essence of the whole problem of employing women workers in mines, mills, and smelters is revealed most clearly in the following conclusions drawn independently by two different companies who have hired a goodly number of women in World War II:

"For plants that are shorthanded and are contemplating employment of women, we recommend that they **first hire a capable woman adviser** for staff advice and counsel. . . ."[1]

"Probably the **first woman hired** by a mining company beginning to employ women in operating jobs **should be a capable female administrative assistant** who could advise employer and women how best to get along."[2]

Obviously this suggests just one conclusion—men don't fully understand women, but women do, so why not make things easy by employing women to help in handling women?

A second suggestion to bear in mind is the following offered by a successful Western property manager: "Before hiring women, first consult State and Federal authorities as to the conditions and limitations of their work. Also, where labor contracts are in effect, be sure to arrive at a pre-employment agreement as to the disposition of women after men employees become available."

The next opinion that virtually all supervisors and managers volunteered was this: "If we don't have to hire women for operating jobs, we'd rather not." This frank statement, we hasten to add, was not made in an uncomplimentary vein, for most of the same parties interviewed stated that they were "darn glad to have the women workers during the emergency." However, at times many of the jobs called for greater physical effort than women should be required to exert, and this meant calling men off of other jobs to help out. In one operation men employees were asked temporarily to surrender skilled jobs not requiring great physical effort and take tougher

[1]Women Workers at Flin Flon Air Record Zinc Output. By John Carr, Supt. of Zinc Plant, Hudson Bay Mining & Smelting Co., E&MJ, April, 1945.

[2]What Mining Men Are Doing About the Manpower Shortage. E&MJ, May, 1945.

and less-skilled jobs to accommodate women workers. The men did this willingly during the emergency.

Employers also reported that the employment of women "introduced certain extra problems and difficulties" which didn't have to be met if the shifts were composed of men only. Now just what were some of these "extra problems," and how did women workers compare with men workers? These questions are answered in the following opinions of mining men as expressed and summarized below:

What kinds of jobs did women perform satisfactorily? Answers included these: Ball mill operators, flotation operators, filter operators, thickener operators, Shriver filter-press operators, pan feeder operators in crushing plants, belt pickers, concentrate loaders, samplers, sample preparation, assistant assayers and chemists, maintenance workers, sweepers, oilers, carpenter helpers, electrician helpers, repairs, warehouse clerks, casting operators in cadmium plant, cathode strippers, switch tender in open-pit mine, motor-car operators, battery truck operators.

How does the amount of work done by women compare with that done by men? Several mill supervisors said that women can do as much as men in the less strenuous operating jobs. One operator of a large crushing plant said that "four women can do the work of three men, and about one woman in 30 can do any job a man can do." An executive of a large copper company estimated that "92 women can do the work of about 80 men." A smelter reported that "women did very well in operating jobs, but in work requiring considerable strength, such as unloading ore, they could only do about 60% as much as men." Still another mill superintendent said that some women operators were better than men, and a crushing-plant foreman commented, "We never knew we had a concrete floor in this plant until we hired women sweepers."

When it came to heavy work, most supervisors said that they didn't expect women to do the more strenuous jobs that might be required of men. But even here they noted some startling exceptions. For instance, a woman sweeper in a crushing plant tossed aside a small-size shovel that had been provided for her and asked for "one of them big banjo scoop shovels" so that she could do more work. Another crushing-plant worker was frequently seen wrestling with 5 ft. timber caps about 1 ft. in diameter that occasionally landed on the pan feeder, and she didn't call for male help.

What about absenteeism? "Too darn much," said one plant foreman. Another said that "it was inclined to be a little higher for women than for men." Statistically, one company reported that the ratio of absenteeism due to sickness as compared with that for men was 3.0 for women to 2.1 for men employees.

Labor turnover? One Canadian operator observed, "Labor turnover has been much higher with women than with men mainly because they must assume much greater responsibility at home," and concluded that "regardless of wage rates and working conditions, a heavy turnover appears to be inevitable." An Arizona plant reported a turnover for women of about 200% a year, and another that it was higher for women than for men.

Accident rates? In one instance the accident rate for women was noted as slightly higher than for men, and this was attributed to the fact that women were "working in unfamiliar surroundings with equipment and materials entirely foreign to their previous experience." A crusher foreman recalled that the accident rate for women was quite a bit higher when they were first employed despite a good safety training program. Injuries to fingers were quite common until they learned to develop a healthy respect for moving machinery parts and rock in motion. On the other hand, it was generally reported that women "were good about wearing respirators in dusty jobs," and that they almost all willingly observed regulations about wearing safe, well-fitting clothing with no loose ends, gloves, safety goggles, and protective head covering such as bandanas or caps.

What kind of women prove to be the most satisfactory workers? "Women who have a serious motive in seeking a job," seems to be the most common answer to this question. Management can spare itself many headaches by carefully checking the motives of job applicants. For instance, women who have dependents are generally good workers, or in the words of one manager, "Hire women who need the money. If they really need the money, they try much harder and are not so independent." At least two operators agreed that it was a good idea to give preference to women who had husbands, brothers or fathers in the service, because such employees didn't have to be told "how important it was to get the copper out."

Single girls not falling in the above categories did not rate quite as high, particularly if they regarded the plant as a hunting ground for "Lochinvars." One Arizona manager reported that he had received numerous applications for jobs from Eastern girls who were deluded by over-glamorous press reports about women's jobs in mining areas. The "adventure motive" is not a good one.

Women from local areas are also given preference because imported women inject housing problems into the picture. Wives supported by husbands working in the plant also rated on the low side because the urgency for money in such cases was not so great. There was also the added problem of the husband being concerned about other men working on the wife's shift.

What about women's attitude toward a new kind of work? Here is where the ladies rated a big "A" for effort on their report cards. Just read the following sample comments by various supervisors:

"If you give a woman a routine job, she will follow it perfectly."

"They will try to make good—much more than a man—and will follow your instructions right to the letter."

"Women are much more attentive. Men just didn't give a damn during the war."

"Women show much more interest in their jobs, but they don't catch on so fast."

But strange to say, this desire to make good can be so strong that it leads to frustration. A mill foreman put it this way: "If something goes wrong with a flotation circuit, a woman will try her best to get the unit back to normal. She will try every remedial adjustment she knows, and if these fail, come to me on the verge of tears, wanting to know what to do next. Whereas a man will do a little first class cussing under the same circumstances and then tackle the job with the first display of interest he has shown in months. The result will be the same in either case. We will simply cut down the feed to the circuit, and then gradually build it up again until it performs normally. To the man, this experience has been a challenge, but to the woman, a near tragedy."

Or to sum it up, if things go wrong, women are more inclined to need help, but men seem better able

to worry their way through a situation.

What about women's attitude toward each other? Here is where men better step out of the picture, or at least appeal for help to that "woman councilor" suggested in the opening paragraphs of this article. If you doubt that this is a perplexing problem, read the following comments:

"Women are more inclined to be jealous. You can't play favorites. Must treat them all alike."

"Don't show any partiality. Treat them all alike."

"Women have more anxieties than men. There have been many trifling differences, and a marked tendency to take unfounded gossip seriously."

"We've had lots of jealousy—women wouldn't speak to each other—had to put them on separate shifts."

"Women often have a tendency to misconstrue statements and interpret them as being evidence of partiality, even though nothing even remotely partial was intended."

"If I so much as give a pencil to one woman operator, all of the other operators down the line will be watching and will consider me as being partial if I don't give them all a pencil."

We could add more quotations to the list, but the above will suffice to indicate that the tendency of women to attach significance to trifles constitutes a little headache which the male supervisor would gladly turn over to a "woman councilor."

What is the best way to get along with women workers? This question almost always brings a slow broad grin to the face of the answering supervisor, which seems to say, "Brother, I sure learned the answer to that one the hard way." Here are some answers:

"Have as little to do with them as possible, except on strictly business matters."

"Tell 'em what you want and no more."

"Don't play favorites. Set rules to go by and see that they all follow them."

"Women are awfully sensitive. If, for instance, I happen to have a serious problem on my mind and fail to look up when I pass a woman operator, she is very likely to think I am mad at her and start to fret about it. A man wouldn't even notice it. So you can't ignore these little sensitivities."

"A boss has to be firm about his rules and orders. If he shows any signs of indecision, he can always expect a few women on every shift to get him to back up on his rules."

"It's just like a department store hiring a bunch of women clerks. All rules covering the job have to be made clear and insisted upon such as starting and quitting time, lunch hours, relief periods, absentee rules, job responsibilities, etc."

Here is how one mill superintendent summed up the supervision problem:

"We had three foremen here, each of whom tried a different technique, unintentionally, of course, but the results were very interesting:

"Mr. A decided to be tough and abrupt. He was openly partial to the good operators and fired the bad ones without any hesitation. Result: He was always in a turmoil, had his shift in perpetual hot water, and didn't get along so good himself.

"Mr. B was a softy and just naturally liked women. Result: The women ran him. He wound up with a jealous shift, and all the women watched him to detect any signs of partiality.

"Mr. C was a little smarter. If women were just downright inincapable, he didn't fire them. He just shifted them from one job to another until they convinced themselves that they were not doing very good, and then they quit. Result: He had a smooth shift."

It all adds up to this: A little knowledge of feminine psychology won't harm a foreman.

What do the unions think about women workers? On the whole, during the war unions approved of women workers, accepted them as members, and included them under the coverage of their labor contracts. They were given seniority rights, specified pay rates, and special 6-month maternity leaves with the privilege of an extension in some areas.

But after the war, particularly during the price slump of 1949 when married men with dependents were being temporarily laid off, some unions requested management to lay off the women. One local said it was all right for women to work in an emergency, but thought that they "should be turned loose" after the war. However, on this point one union in a given district might request dismissal of women while another would ask that they be retained.

One manager recommends that labor contracts covering women workers for emergencies should be drawn up with great care. Among the items to be included in the contract are these:

1. Specification that the women are employed as emergency "production trainees."
2. Stipulation of a starting salary plus provision for an advanced rate if the trainee qualifies after a reasonable period of time.
3. Regular monthly reports by supervisors to establish and record the progress of trainees.
4. Clear stipulation of seniority rights of trainees (if any) as distinct from seniority rights given workers under normal labor contracts.
5. Stipulation that special "trainee" contracts are void when a national emergency ceases and the union is capable of furnishing a sufficient number of qualified men.

How do women's pay rates compare with men's? In a Utah operation, women received the same pay for switch tending and clean-up work as men did. A Canadian company adopted a policy of "equal pay for equal work" under which women were placed on the same rate system as for men after a breaking-in period, which generally lasted 30 days. One Western operation paid women the same as men for jobs in the mill, and another paid the same if they "did a comparable amount of work." One operator paid somewhat less for women on the theory that women did less work.

What about moral standards among women workers? Virtually all agreed that with few exceptions the women employed contributed no problems in this respect. One operation reported that "A very few have not measured up to the character standard set by the women employees themselves, and these had to be dropped." And another supervisor said he had very little trouble in his mill, but that "when a woman is bad, she's really bad, and you have to get rid of her quick." A Canadian company reported that the women employed in the operations "have been far superior to the average woman employed in industrial districts."

The most fitting way to conclude this article seems to be to complete the quotation cited in the opening paragraphs:[1] "For plants that are shorthanded and are contemplating employment of women, we recommend that they first hire a capable woman adviser for staff advice and council; next that they purchase a large bottle of aspirin for the small daily headaches, and then stop worrying about production."

Tax Tips for Small Mines

The Federal income tax laws are immensely complicated, and in most cases business enterprises will do well to put their tax-return problems into the hands of tax specialists, whether hired full-time or on a consulting basis. However, for the benefit of those operators to whom such services are unavailable, E.&M.J. asked Mr. Randall to provide some "pointers." He discusses five features frequently misunderstood and not to be overlooked on tax returns.

LESTER J. RANDALL
Wallace, Idaho

LESTER J. RANDALL, a certified public accountant, is secretary-treasurer of Hecla Mining Co., Wallace, Idaho, an officer of several affiliated companies in the Coeur d'Alene district, and a consulting partner in the accounting firm of Randall and Magnuson. He is a member of the American Institute of Accountants and active in the American Mining Congress tax committee. His numerous connections with small mines make him especially well qualified to discuss their tax problems.

THE PREPARATION of Federal income tax returns usually involves most of the same complicated problems, regardless of whether the operation of the taxpayer is large or small. Consequently, it is little wonder that the small mine operator, who does not have a tax specialist available for consultation, may often overlook tax benefits to which he is legally entitled.

Perhaps the best way in which to approach the mine tax problem simply is to discuss a few of the errors made on Federal income tax returns, the most common of which are as follows:

1. Use of *percentage depletion* as a deduction rather than *unit cost depletion* in cases where the latter method of computing depletion results in a greater tax benefit.
2. Failure to recognize the date at which a mining operation passes from a development to a producing status.
3. Failure to use the most advantageous method for computing depreciation.
4. Failure to segregate into separate accounts, during the exploration and development period, expenditures made for depreciable items such as equipment and plant facilities, as distinguished from other expenditures made for exploration and development.
5. Failure to utilize the tax benefits to be derived from net operating loss carry-overs and carry-backs.

The above items are discussed in the order in which they are enumerated.

Percentage Versus Unit-Cost Depletion

For Federal income tax purposes, there are two methods for computing depletion, namely, the unit-of-production method, commonly referred to as "cost, or March 1, 1913, value depletion," and the percentage-of-income method, commonly referred to as "percentage depletion." Under present law, the taxpayer actually has no alternative but must deduct depletion computed by whichever method results in the greater tax benefit. Therefore, if the taxpayer has used percentage depletion for a given year, he should amend his returns if cost or March 1, 1913, value depletion results in a greater tax benefit, provided, of course, that his return is amended prior to the applicability of the statute of limitations, which is ordinarily three years from the due date for filing the return.

Computations should be made on both the unit-of-production basis and percentage-of-income basis at the end of each year. Aside from determining which method results in a greater tax deduction, the taxpayer should make this computation for the determination of "earned surplus available for dividends to the shareholders," in which case depletion must be computed on the unit-of-production method. The following explanations set forth the basis for computation under each method:

Cost, or March 1, 1913, Value Depletion

In order to properly compute "cost depletion" based on the unit-of-production method, the taxpayer must ascertain these factors:

A. Cost of acquisition of the mineral property, plus total cost for exploration and development incurred prior to the producing status. (In cases in which the mineral property was acquired prior to March 1, 1913, the taxpayer should determine its value as of March 1, 1913. However, because of the relatively few cases in which presently operating properties were acquired prior to March 1, 1913, we shall confine our discussion to depletion of costs applicable to properties acquired after March 1, 1913.)

B. Total depletion allowed or allowable on tax returns prior to the taxable year.

C. Estimated recoverable mineral units in the property as of the beginning of the taxable year.

D. Mineral units sold in the taxable year.

Having determined the above factors, cost depletion is computed by reducing the cost of acquisition of the mineral property plus costs incurred for exploration and development (A above) by the total depletion allowed or allowable on prior returns (B above). The result represents "unrecovered remaining costs" which, divided by the estimated total recoverable units at the

TAX LEGISLATION IN 1950

In passing an excess-profits measure late in December, Congress also revised the Revenue Act of 1950 passed earlier in the year.

The revised law, which affects income earned after June 30, 1950, raises the ordinary income tax from 38% of taxable net income to 47%. A tax of 25% is levied against the first $25,000, and 47% against the balance.

To this, Congress added an excess-profits tax of 30% on net income in excess of 85% of the average for the three best years out of the four from 1946 to 1949. Or, for this "85% of average earnings base," the taxpayer can substitute the following rates of return on invested capital: 12% on the first $5,000,000; 10% on the next $5,000,000; and 8% on capital in excess of $10,000,000.

If the "base" is less than $25,000, no excess-profits tax will apply. Also, a ceiling of 62% of total net income is placed on the combined tax burden.

Producers of strategic materials are exempted from excess-profits taxation, as in World War II (but excluding beryllium and trona). This list can be extended by Government defense agencies.

Contrary to World War II procedure, the law exempts Government subsidies for mineral output from excess-profits taxes. There is also a provision granting exemption for part of the income of mines due to increased output or due to the opening of new properties.

Special provisions are included to avoid undue hardship to "growth" companies. Also, to companies using the invested capital base for excess profits, 75% of borrowed capital can be classed as invested capital, and additional credit can be obtained for one-fourth of the interest paid on borrowings.

Congress indicated that the new law is a stop-gap, and will probably be revised next year, particularly to take care of hardship cases and to provide even larger revenues for financing the defense program.

Whatever changes are in store, taxpayers can be sure that we are going to have severe tax rates for several years to come, and that the Government will have to depend more heavily on taxes and less in proportion on borrowings than in recent years.

beginning of the taxable year, as determined under "C" above, will give us the depletion sustained per recoverable mineral unit. This figure, multiplied by the total units sold during the taxable year, represents cost depletion deductible for the taxable year.

The cost of acquisition of the mineral property quite often becomes rather involved, and I would suggest that the advice of a tax consultant is usually necessary, especially if there have been reorganizations, or in cases in which capital stock is issued for the claims. The determination of estimated recoverable mineral units under (C) is an engineering problem. Regulation 111, Sec. 29.23 (m)-9 sets forth the factors to be considered by your engineer in making the determination.

Percentage Depletion

Depletion computed on the percentage-of-income method represents, in the case of metal mines, 15% of the gross income from the property.[1] However, the deduction is limited to 50% of the net income of the taxpayer (before deducting depletion). Without going into the technical definition of what constitutes gross income from the property and net income of the taxpayer, I might say that in most instances gross income, in a non-ferrous metal mine, represents the net smelter returns less cost of transportation of the concentrates from the mill to the smelter, provided the ore is sold to a custom smelter. If the taxpayer sells his ore to a custom mill, gross income would represent the selling price of the ore to the mill and might be materially less than in cases in which the taxpayer retains title to the product until such time as it is converted into concentrates and sold to a custom smelter. For a more complete definition of gross income from the property, the reader should refer to the statutory definition under code section 114(b)(4) (B), and to the definition given in Regulation 111, Sec. 29.23 (m)-1 (f).

Net income of the taxpayer generally represents the gross income from the property reduced by the cost of milling, cost of mining, general expenses, state and county taxes, and, in fact, all expenses attributable to the operation of the property, with the exception of depletion and Federal income taxes. For a more inclusive definition of net income of the taxpayer, refer to Regulation 111, Sec. 29.23 (m)-1 (g). There is no statutory definition for net income of the taxpayer.

[1] A limited list of non-metallic minerals is also entitled to the percentage depletion alternative. These are: bauxite, fluorspar, flake graphite, vermiculite, beryl, feldspar, mica, talc, pyrophyllite, lepidolite, spodumene, barite, ball, sagger and china clay, phosphate rock, rock asphalt, trona, bentonite, gilsonite, potash and thenardite, all at 15%. Coal is 5%, sulphur deposits 23%, and oil and gas 27½%.

Changing to the Producing Stage

During the exploration and development stage, all expenditures other than those for depreciable mine and mill equipment in excess of net receipts from minerals sold should be charged to an exploration and development account, which is recoverable only through depletion based on the unit-of-production method. For income tax purposes, Regulation 111, Sec. 29.23 (m)-15 provides that the mine is considered to have passed from a development to a producing status when:

A. The major portion of the mineral production is obtained from workings other than development openings, or

B. When the principal activity of the mine becomes the production of developed ore rather than the development of additional ores for mining.

It should be noted that a producing status is reached when either of the above conditions occur. In my opinion, the mine has probably passed from the develop-

ment to the producing status whenever a point is reached in which the major portion of ore produced is extracted from what we commonly term "stoping operations" rather than from development openings, such as drifts and raises. It is very important that the operator should keep this point in mind for the reason that all expenditures incurred after the mine reaches the producing status can properly be treated as operating expenses. These are either deductible in the current year, or, in the case of extraordinary expenditures benefiting operations of future years, such costs may be set up as operating expenses to be deducted pro-rata over the recoverable mineral units as extracted. Expenditures incurred after the producing status is reached are deductible no matter whether depletion is based on the unit-of-production basis or the percentage-of-income basis. However, expenditures incurred prior to the producing status are deductible only as cost depletion in cases where the taxpayer uses the unit-of-production basis.

The following illustration might emphasize the effect of failure to recognize the transition point. Let us assume a property had legally transferred from the development to the producing status as of January 1, 1950. However, the transition point is erroneously recorded as of June 30, 1950. During the intervening period from January 1, 1950, to June 30, 1950, a total of $100,000 has been expended for extension of the shaft. Due to the error in recognizing the transition date, this entire amount is erroneously charged to development, recoverable only through depletion. In event the taxpayer deducts depletion on a percentage-of-income basis in subsequent years, he is not entitled to write this expense off as an operating cost unless, of course, the error is found and proper adjustments made.

For purposes of this illustration, we are assuming that receipts from the sale of ore during the period from January 1, 1950, to June 30, 1950, did not exceed the cost of operating, exclusive of the $100,000 expended for extending the shaft. When we consider that corporate tax rates for future years may exceed 50%, we can readily appreciate a possible loss of $50,000, which results merely from failure to recognize the date at which the mine passes from the development stage and goes over to the producing status.

Methods of Computing Depreciation

In a trading concern, the most usual method for computing depreciation is on what is commonly called the straight-line method, in which case the cost of the item, less salvage value, is charged off over the estimated useful life of the item. For example, if a piece of equipment is acquired on January 1, 1950, at a cost of $22,000, and we estimate that it has a useful life of approximately ten years, at which time it will have a salvage value of $2,000, we would depreciate that item on a straight-line basis at the rate of $2,000 per year ($20,000 ÷ 10 years).

The straight-line method of depreciation is usually not adaptable to a mining operation for the reason that the life of the equipment usually has little or no relationship to the life of the mine. For example, if we assign a ten-year life to depreciable equipment, and the orebody of the mine is exhausted at the end of five years, at which time the equipment has little or no salvage value, the annual depreciation deduction of 10% has obviously been inadequate. I would, therefore, suggest that in most cases the unit-of-production method for computing depreciation would be more adaptable insofar as mining is concerned. Under this method, the remaining cost of the depreciable equipment is deductible pro-rata over the ore reserves as the ore is extracted. This computation is made on the same basis as that used for computing depletion on the unit-of-production basis discussed above.

Depreciable Items During Development

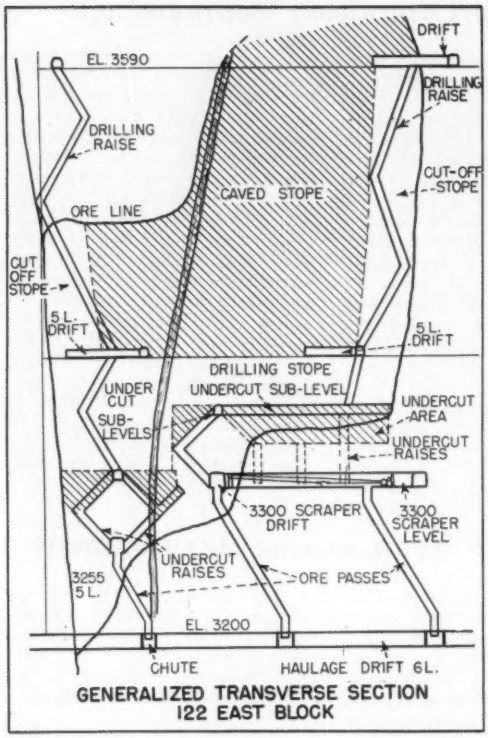
During the exploration and development period, we quite often find that an accurate segregation has not been made in the accounting records between expenditures made for depreciable items, as distinguished from other expenditures made for exploration and development. The entire cost of sinking a shaft during the development period, for example, may have been charged to "development costs" and thus be recoverable only through cost depletion. In my opinion, the skip, or cage, pipe and timbers, etc., are all items subject to depreciation through wear and tear, and the costs, including installation, are more properly chargeable to the depreciation account. In the absence of adequate accounting records, I would suggest that as of the date the mine reaches a producing status, a complete physical inventory should be made of all depreciable mining equipment. The inventory should set forth in detail the date of acquisition, cost, and estimated depreciation sustained to date on each item. Records of the company should be adjusted to bring them into agreement with the physical inventory. The taxpayer should then secure the permission of the Commissioner of Internal Revenue for computing depreciation on the unit-of-production basis in case, of course, he elected this method in preference to the straight-line, or some other method previously used.

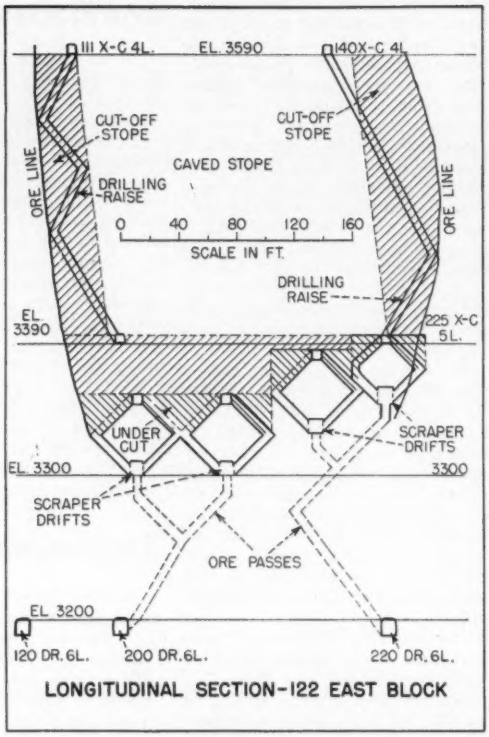
Total depreciation already sustained, as determined when the physical inventory is taken, should be charged to exploration and development costs, since such depreciation was sustained during the exploration and development period. The basis for further depreciation would represent the physical inventory at cost, less the depreciation sustained as of the date the mine reaches the producing status. The segregating of depreciable costs from depletable costs, in order that depreciation may be properly computed, is important. The taxpayer is entitled to deduct the full amount of depreciation sustained, whether or not depletion is computed on a unit-of-production basis or percentage-of-income basis. However, if he has buried the cost of depreciable items in his development account, he will lose the depreciation deduction on such items if he deducts depletion on the percentage-of-income basis.

Loss Carry-Overs and Carry-Backs

For taxable years ending after December 31, 1941, and before December 31, 1949, the taxpayer has the right to carry a net operating loss suffered in the taxable year back two years, and to the extent not utilized in those prior years, the

(*Continued on page* 128)





INDUCED CAVING METHODS and scraper installations were important factors in establishing new economies.

HORIZONTAL DIAMOND DRILL HOLES are employed to start stopes; thereafter induced caving breaks ore.

Granby Offsets Rising Costs

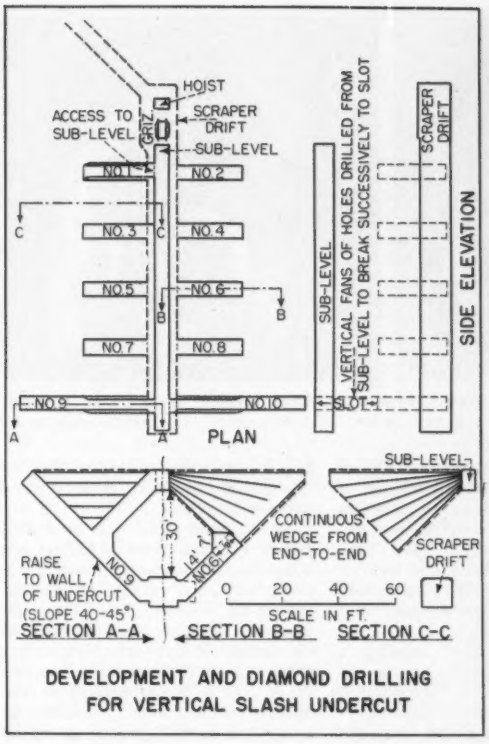
During the 1940-49 period when driller's wages rose from $5.13 to $10.00 per machine shift, Granby reduced cost per ton of broken ore from $0.112 to $0.060. Read how this was accomplished on less than 1% copper ore in the following article.

JOHN B. HUTTL
Associate Editor

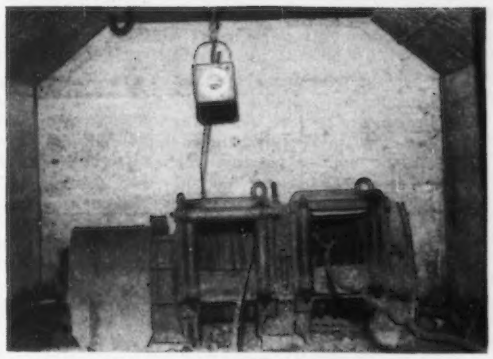
RISING TAXES and soaring costs of supplies, labor, freight, and smelting have forced the management of Granby Consolidated Mining, Smelting and Power Co., Ltd., to tackle the problem of improving mining and milling efficiency with vigor at the Copper Mountain and Allenby units in the Similkameen District of British Columbia. With ore averaging less than 1% copper, this task has not been an easy one. But it has been accomplished and chiefly by these means: 1. Thorough mechanization of underground operations. (Costs are now considered to be the lowest in North America, if not in the world.) 2. Increasing the tonnage put through the mill. (Original capacity of the mill was 2,000 tons, but by the addition of modern milling units tied in with an improved flowsheet of existing units, this has been increased to 5,500 tons per day.) 3. The successful use of low-grade lignite for generation of electric power.

This article covers the improved mining methods at Granby, and a subsequent one will discuss the efficient milling methods employed. The following brief account of the geology of the orebody will aid in understanding the mining technology:

At Copper Mountain a roughly circular stock of gabbro, about 4½ miles across, has intruded a volcanic series. The district is bounded on the west by the Coast Range batholith, and on the east by the Shuswap series of Pre-Cambrian schists. The oldest rocks in the map area consists of a series of volcanic flows, tuffs, and breccias known as the Wolf Creek formation. Intruded in this formation, probably of Triassic Age, are several distinct stocks of medium coarse grained material, dioritic in composition. The Copper Mountain stock bears an important relationship to the ore deposits. Syenitic pegmatite dikes and granophyre and felsite porphyry dikes are plentiful in the area and cut the stock. In places,



DIAMOND DRILLING plays an important part in the mining of the vertical slash undercut during development.



BLAST-HOLE DIAMOND DRILLING (above) and concreting of slusher drifts help reduce cost per ton mined.

By Improving Mining Method

the Wolf Creek formation is overlain by amygdaloidal flows, tuffs, and breccias.

The ore consists of mineralized breccias of the Wolf Creek formation adjacent to the contact of the Copper Mountain stock. Ore minerals are found disseminated through the altered host rock and consist of bornite and chalcopyrite with magnetite. Following the introduction of pegmatitic material, a later mineralization deposited bornite, chalcopyrite, chalcocite, hematite, and covellite, all closely associated with pegmatite material. Further mineralization took the form of covellite and chalcocite by a supergene replacement of bornite and chalcopyrite. Gangue material in the ore consists of minerals of the altered breccias of the Wolf Creek formation, including feldspars, augite, biotite, epidote, apatite, magnetite, hematite, serecite, calcite, and possible chlorite along with other alteration products.

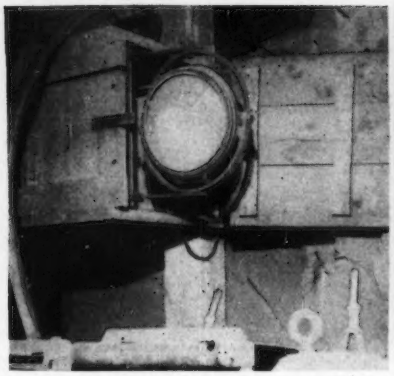
Principal mining openings include No. 1 shaft used exclusively for handling men and materials, No. 2 internal shaft, and seven levels, known as 2, 3, 4, 5, 6, 7, and 8. The collar of No. 1 shaft is at an elevation of 3,985 ft., and its sump just below the No. 6 level. This is the main haulage level, and along it all ore is trammed to the primary crushing plant situated a short distance from the portal at an elevation of about 3,170 ft. The three-compartment No. 2 shaft extends from No. 6 level to below No. 8 level.

Successful and profitable mining of the low-grade blocks of ore requires continual vigilance and ingenuity on the part of the mine staff. To keep ahead of rising costs of labor, supplies, power and labor shortages, the mine has gone through several ore-breaking stages in recent years, each an improvement on its predecessor. Methods used included shrinkage stoping, gloryhole mining, spiral stoping combined with pillar blasts, diamond-drill shrinkage stoping, and diamond-drill blast-hole stoping with induced caving.

Every change in mining method brought about an increase in the number of tons broken per machine shift and a corresponding drop in the cost per ton of ore. The respective figures are 86.9, 195.4, 129.2, 350.7, and 651.3 tons per machine shift. Cost per ton of ore in broken ore inventory during the period 1940-49 gradually dropped from $0.112 to about $0.060, while the average driller's basic wage rate rose from $5.13 to $10.00.

Largest tonnage increases were obtained with the blast-hole diamond drilling methods. The first,

Scraper drift details



FLOODLIGHTS (left) assure good vision for scraper operators and are retractable to prevent damage by flying rock. Tailrope lead block (center) saves ropes. Concreting draw points in drift (right) cuts maintenance costs.

known as the Horadiam method, was developed and applied in 1943 when broken ore reserve was dwindling fast because of efforts to provide all the copper possible for World War II. The second method differs from the original Horadiam layout in that slusher drifts have been substituted for the grizzly chambers formerly used. This has resulted in a substantial saving in development work, improved ventilation, faster flow of broken ore to loading points, and location of ore passes in good ground. The Horadiam method is described in T. P. 1914, AIME.

Horadiam Stoping Method

Explained briefly, this method involves drawing horizontal plans for every 30-ft. vertical interval of the orebody and laying out drilling raises so as to be in the most advantageous positions on each plan. Next the diamond-drill holes are planned for each 30-ft. elevation with 6-ft. spacing at the bottom of the holes and with maximum length limited to 100 ft. Total drilling footage was obtained from these plans, and there are four drilling rings between plans. Loading is then detailed on the plans. The holes are loaded to various distances from the bottom to a point where there is about 3½ ft. of space between the powder columns in the holes on either side or next nearest column of explosive. By this method every fifth hole is loaded to the collar. The drilling raises are carried upward 6.5x6.5 ft. in cross-section, and one drill only is employed in a raise. The diamond-drill holes (more than 90%) measured 1-3/16 in. in diameter. Footage drilled averaged 80. The burden between rings ranged from 7½ to 10 ft., depending on the nature of the ground. Performance data are as follows: Tons broken per ft., 3.64; total cost per ft., $0.548; total cost per ton, $0.1505; and powder consumption was 0.23 lb. and 0.49 lb., respectively, for primary and secondary breaking.

Current practice of mining a block of ore previously prospected by diamond drilling is illustrated in the accompanying drawings. Haulage drifts are carried forward 11x11 ft. in cross-section; development drifts outside of the ore zone, 6x7 ft.; manways and ore passes, 6x9 ft.; scram or slusher drifts, 8x8 ft.; and finger raises driven at an angle of 45 deg. and drilling raises, 6.5x6.5 ft. The scram drifts are established about 60 ft. above the haulage level, and they do not exceed 125 ft. in length. Finger raises are spaced at 25-ft. intervals. A manway and ore pass are at each end of a scram drift. The number of raises for drilling stations depends on the size of the orebody, maximum economical length of drill hole, time required to mine the orebody, and the shape of the orebody.

Diamond drilling is done with T.N.T. No. 2 International Multifeed Drill Co. drill powered by a 10-hp., 3,500-rpm. multivane air motor. Total weight of frame and feed motor is 110 lb., and air consumption 240 cfm. The feed motor gives forces up to 2,500 lb. and any speed desired. Water pressure is about 200 lb. Size of hole drilled in general work is 1-3/16 in., but in ore contouring and in seams 1-7/16-in. holes are drilled. Clearance between the rods and hole is 1/64 in. Maximum length of holes drilled is 100 ft., the average being 40 ft. The 1-3/16-in. drill rods used are 2½ ft. long and weigh 2.5 lb. per ft. Couplings have four square threads per inch.

The number of holes to be drilled per ring and pattern of layout are determined by the engineering department after study of ground conditions. After the holes are planned, the lines are laid out for the drillers. Ring overburden ranges from 8 to 15 ft. and spacing in toe from 5 to 8 ft., depending on the nature of the ground. Loading of holes follows that practiced in the original Horadiam method, and powder used is 1½x8-in. 40% Polar Forcite. The blasting crew consists of two men. The 1-in. round loading sticks employed are made from hard wood and made up in sections 4 ft. long. A thread arrangement at each end of the stick to connect them together facilitates their orderly pushing into and removal from a drill hole. Five-foot lengths of 1-in. X-R diamond-drill rods are used for blowing out the holes. Loaded holes are detonated by No. 8 electric instantaneous detonators.

Induced Caving Cuts Drilling

During the last two years diamond drilling per ton of ore broken has been reduced materially as a result of the induced caving feature included in the modified Horadiam method in use today. About half of the ore shipped to the concentrator is obtained by induced caving. Total cost per foot of hole drilled during 1949 was $0.63, and tonnage broken for each diamond-drill machine shift worked exceeded 650. Powder consumption amounted to about 0.21 lb. per ton.

Drilling in haulage and development drifts is done with I-R and G-D automatic drifters fitted with

New York back-heads and using 1¼-in. air hose and ½-in. water hose. The drills with forged-on bits are made from Vibresist alloy steel costing about 17½c. per lb. The machines are used in conjunction with special 2-machine drill jumbos.

Lightweight Drills Used

A new drilling feature introduced recently is the use of light-weight Atlas Diesel units of Canadian Copco, Ltd., consisting of a 42-lb. sinker-type drill, 40-lb. pneumatic pusher, and Coromant alloy drill rods with nondetachable tungsten-carbide chisel bits. Results obtained so far in large and small drifts have been most satisfactory. The drill setup can be operated by one man. As to actual performance, one example may be cited. In a 7x7-ft. scraper drift advanced in feldspar porphyry two drill units completed a 17-hole round (8 ft. deep) involving 130 ft. of drilling in 99½ min., the actual machine drilling time being 90½ min. The steel used was a ⅞-in. hexagonal Coromant drill rod with chisel type bit and tungsten-carbide inserts. Experience has shown that the drill steel is good for about 500 ft., and direct drilling cost is about 5.1c. per ft. The drill can be operated with ¾-in. air hose, and with suitable attachments can be used as a plugger, drifter or stoper.

In raise work I-R and G-D automatic stopers using ⅞-in. quarter-octagon alloy steel with forged-on bits are used. Drift and raise rounds are blasted with 1⅛x8-in., 40% Polar Forcite powder and electric blasting caps. Performance per man shift in drifting and raising in 1949 was 1.36 and 2.37 ft., respectively.

Mucking in lateral workings is done with No. 40 and No. 120 Eimco rocker shovels, and in some instances with scraper assemblies consisting of 5- and 7-hp. I-R slushers and 30x36-in. scrapers of local design. On the intermediate levels broken ore is transported in standard 1-ton mine cars, and on the main haulage levels, the No. 6 and No. 8, in 130-cu.ft. Granby cars drawn by 10- and 12-ton trolley locomotives. Tracks are spaced 20 in. and 36 in., respectively, and rails used weigh 30 lb. and 90 lb. per yd. Ore loading pockets on main haulage levels are air-operated and the chute opening is wide enough to load a car without its moving. The 12-car trains operating between loading points on No. 6 level and the primary crushing plant near the portal are directed by a block light system to eliminate accidents and reduce delays on the line to a minimum. As designed, the trains are spaced at 300-ft. intervals. Average load of one train per trip is 60 tons, and about 7,000 ft. of travel is required for each round trip.

Scram drifts serving the ore passes leading to the loading points on the haulage levels are concreted. These are driven 8x8 ft. in cross-section and vary in length from 80 to a maximum of 125 ft. One end is widened to 10 ft. to accommodate the 50-hp. slusher just back of the grizzly. The tail block post is installed 20 ft. beyond the last draw point. Draw points are spaced on 25-ft. centers and are driven 6x6 ft. at plus 45 deg. Whenever possible the raises are taken off both sides of the scram drift directly opposite each other. It has been found that scram drifts with staggered draw points are less productive and damage done to equipment is high. Drifts in favorable ground and draw points are slashed to size before placement of concrete.

Forms Are Prefabricated

The 12-in. concrete lining is placed by specialized crews, and operating technique is as follows. Prefabricated wooden forms are used. Each set consists of two wall and two curved arch units forming a 5-ft. lineal section of drift and requires about 90 min. for assembly by a four-man crew. The floor of the drift is poured first and allowed to set 24 hr. before actual installation of sets commences. This is followed by placing four sets, giving a 20-ft. lineal section of drift, which are poured at one time. As a pour progresses, pieces of old drill steel 18 in. long are inserted to a depth of 9 in. into the concrete to strengthen the bond between pours and to facilitate tying in the succeeding pour. To eliminate the presence of joints over the brow of a draw point—the part of the drift receiving the greatest abuse from blasting and rolling muck—it has been found advisable to make one continuous pour of any drift section containing a draw point.

Save for the sealed ends, the forms are left in place for 4 or 5 days. The end sealing boards, on the other hand, are removed after the concrete has taken an initial set of 24 hr. to permit erection of the succeeding section of forms. Where standard Portland cement has been used, the concrete is allowed a minimum of 3 months to set before actual start of ore production. Use of quick-setting Lumnite cement in some instances has made it possible to bring a heading back into production within 24 hr. after pouring. High cost of this type of cement limits its use to small, important repair jobs.

Equipment used in placing concrete includes a 3½-cu.ft. batch-type electric-driven mixer mounted on four standard mine car wheels at 20-in. gage; a blowing machine of local design with a capacity of 4 cu.ft.; 7-in. Pumpcrete pipe; and a concrete vibrator. The mixer and blowing machine whenever possible are set up at the bottom of a draw point raise connected through to the next level by a service raise temporarily used for gravel storage. Such an arrangement eliminates costly hand tramming of gravel and insures ample gravel storage space.

Concrete Is Blown In

The mixer is mounted on a raised platform to permit discharge of a batch direct into the hopper of the blowing machine below. From here the concrete is blown to the required form by direct air pressure (80 to 100 psi) through 7-in. Pumpcrete steel pipe. With this equipment raising concrete 70 ft. vertically through 200 ft. of pipe has presented no difficulties. The mix used is 1:1½:3½, and a five-man crew can place from 15 to 20 cu.yd. of concrete per 8-hr. shift. Average cost per lineal foot is $93.12, which amounts to about $0.022 per ton of ore shipped.

The scraper assembly used in a completed scram drift consists of a 50-hp. M.M.4D I-R slusher and 66-in. scraper of local design. Tail rope lead blocks suspended from permanent anchors consisting of three wraps of 1-in. cable looped around a 4-ft. length of 45-lb. rail imbedded in the concrete roof of the drift are spaced at 40-ft. intervals. Used ⅞-in. and 1-in. cables are used for lead and tail ropes. About 10,000 c.f.m. of air are blown through each scram drift for ventilation purposes.

E&MJ expresses its thanks to A. S. Baillie, president of Granby Consolidated Mining, Smelting and Power Co., Ltd., for making this useful information available to the mining industry, also to Walter I. Nelson, general superintendent; R. S. Douglas, mine superintendent, and L. H. McKay, mill superintendent, all of whom have greatly assisted in the preparation of this and a subsequent article on milling.

IN THE 600-FT.-BROAD PIT, dragline and shovel load 10-ton dump trucks.

Modern Equipment Revives Old

NO BLASTING IS NEEDED in shoveling the shale ore.

DEAN SIMS
Kansas City, Mo.

BY AN INTERESTING COMBINATION of perseverance, skill, and modern equipment, a pair of Tri-State enterprisers have developed a unique and profitable operation on a property abandoned only a few years ago as depleted.

The place is the Snapp property, near Oronogo, nine miles north of Joplin. It was opened and operated in the late thirties and during the war by Kansas Explorations, Inc., a St. Joseph Lead Co. affiliate. This is a section of the Tri-State district which had its heyday many years ago, and in which the Oronogo Circle open-pit and the Snapp mine were the chief points of interest in recent years.

The operators of the new mine are Geo. W. Potter and Dewey Sims. Both have had long experience in Tri-State operations. Potter was executive vice-president of the Eagle-Picher Mining and Smelting Co. for several years. Under his leadership, this company became a going operation beginning with an aggregation of properties considered to be more or less depleted, built the famous Central mill, and acquired the extensive mining properties of the Commerce Mining &

TROMMEL-WASHER, lower left, pulps the shale for removal.

Tri-State Area

TAKING A BITE with a 25-ton scraper.

Royalty Co. Sims has managed several Tri-State operations in the Oklahoma-Kansas portion of the district.

When Kansas Explorations, Inc., ceased operation after the war, Potter purchased the company's remaining equipment and properties in a negotiation generally believed to contemplate their liquidation as junk. He believed, however, that the old part of the district had been prematurely abandoned in the rush for Oklahoma and Kansas, and made a careful study of the old drilling and mining records of the area northwest of Joplin. As a result, after some new drilling, he and Sims decided that they could mine the shallow portion of the Snapp property successfully by using modern earth-moving equipment to enable low-cost stripping and mining.

Equipment Is Key

The values recovered in the present operation are in shale (Cherokee) which overlies the Mississippian limestone in which most of the ores of the district are found. Shale mineralization was generally passed up in earlier days because of the hazards and difficulties of mining in soft ground. Prior to the development of modern earth-moving equipment, the depth of overburden prevented economical extraction by open-cast methods. The shale is approximately 190 ft. thick on this property.

No Blasting Required

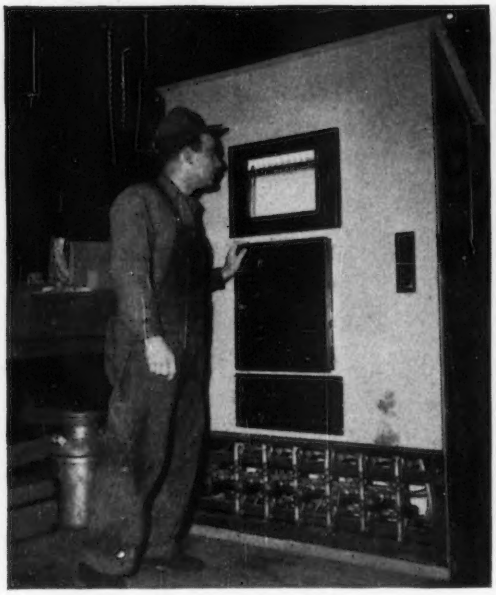
The shale is soft enough to enable ripping by bulldozer without blasting. A Caterpillar D-7 bulldozer does this work in a few hours each day. Stripping was done to a depth of 60 ft. with two Caterpillar D-8 tractors, each in combination with a 25-ton No. 80 Caterpillar scraper.

The ore is mined with a Bay City model 27 power shovel and an Osgood model 200 dragline. These load into Koehring WD 60 Dumptors (10 tons). Roadways in the pit will be developed on 15 percent grades. Ore is handled on day shift and waste with the same equipment on night shift. The mill is fed at night from a stockpile. Excluding the stripping of overburden, the ratio of waste to ore is 2½. The operators expect to mine several hundred thousand tons of ore. About 1,500 tons of ore per day is mined.

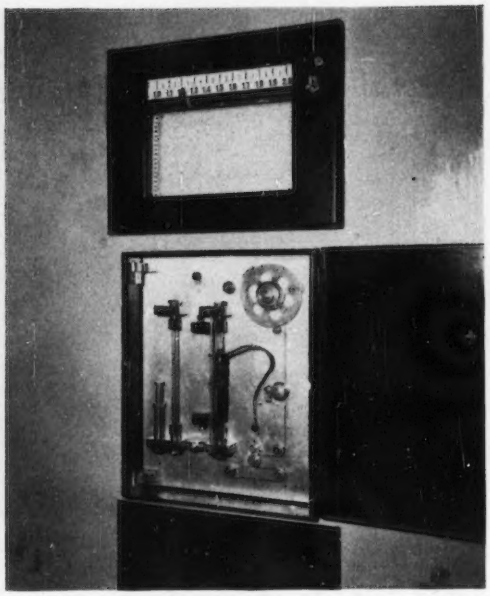
Unusual Milling

The milling is an innovation in Tri-State practice because of the extensive washing and scrubbing necessary to remove the shale. This is done in an Allis-Chalmers 6x20 ft. trommel screen, fitted with a strong spray of water, and baffles and lifting bars in the first two sections, which are blind. The ore is removed from the trommel undersize by Esperanza drags. The coarse ore is hand-picked from the trommel oversize and fed with the Esperanza underflow to a conventional mill, with 42-in rolls, Joplin-type jigs, tables, ball mill, and a flotation plant of 10 Denver cells. The jig feed is rolled to pass a ½ in. screen and the table feed, a 2 mm. screen.

The washing plant discards approximately 40% of its feed and makes a product assaying from 3 to 5% combined lead and zinc. The composite tailings, including scrubber undersize, carry less than ¼% lead plus zinc. The ore as treated yields 3 tons of zinc concentrate to one of lead concentrate. Both these products are of premium quality in comparison to district standards.



IT'S EASIER to operate Combined Metals' Bauer mill, as E. E. Vowles finds, when pulp density is read at a glance.



BRAIN of meter is manometer which registers pressure differences from bubble tubes in mill pulps in classifiers.

An Accurate Density Meter—

Here, in simple terms, is the process of reasoning and experiment by which Mr. Marquardt developed an automatic, continuous pulp density meter. It's ingenious, it's a good idea, and it works.

C. M. MARQUARDT
Combined Metals Reduction Co.
Salt Lake City, Utah

EVERY MILL needs some means of measuring pulp densities accurately and, if possible, continuously. The measuring device must be rugged, accurate, reliable, and it should need but little day-to-day maintenance.

Such a pulp density meter has been devised, and is now in use, at the Bauer, Utah, and Pioche, Nev., mills of Combined Metals Reduction Co. Although the instrument makes use of electronic apparatus, a knowledge of electronics is not necessary to install, operate, or maintain it. Throughout its development, the aim has been to produce an instrument that could be used easily by operating personnel.

In this way, we hoped to make the control job easier for new operators and to improve metallurgical results on the larger tonnages of ore handled in Combined Metals' custom mills. Certainly in a custom mill, where radical changes of ore are the rule and not the exception, accurate measurement of pulp density is of considerable importance.

Perhaps the most reliable method for measuring the specific gravity of an ore pulp is by measuring the differential back pressures that are developed between two bubble tubes that are immersed to different depths in the pulp.

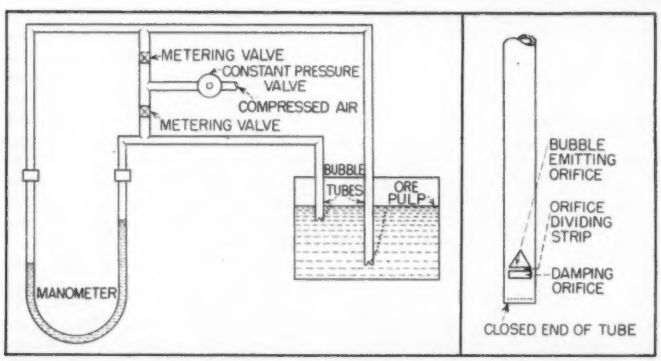


FIG. 1 . . . Here is basis for meter. Air must bubble from tubes at different pressures, manometer shows difference, indicates pulp density. Special bubble tube at right increases accuracy, dampens fluctuations, is easier to keep clean.

NERVE SYSTEM amplifies reading, adjusts recorder. Author and assistant, Maurice Woffinden, built meter in lab.

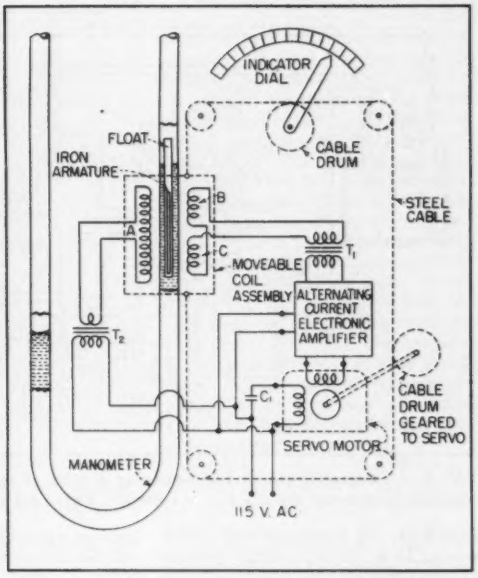


FIG. 2 . . . Hook-up shows how slight movement of manometer float is converted to big movement on dial. (See text)

How It Works, How It Is Used

The principle of such a pulp density meter is shown in Fig. 1. The two bubble tubes are arranged so that a small quantity of air supplied at relatively constant pressure is metered through the metering valves shown and escapes through the bubble-emitting orifices at the bottoms of the bubble tubes. The back pressures on the two bubble tubes are transmitted to a manometer, which will stand at a height that depends (when the difference in elevation of the bubble tubes is constant) on the specific gravity of the fluid in which the bubble tubes are immersed. The reading of the manometer is directly proportional to the specific gravity of the fluid pulp.

In our work, we wanted to measure the specific gravity in the classifier pool. Therefore, a small bubble tube differential was desirable. It was felt that with a three-inch differential on the bubble tubes it would be possible to compensate for the depth of the bubble tubes in the classifier pool.

With a three-inch differential on the bubble tubes, to measure the specific gravity to an accuracy of 0.01 meant that the manometer must be capable of measuring differential pressures to an accuracy of .03 in. of water or 0.0011 lb. per sq. in.

Apparatus then existing for measuring these very small differential pressures under the conditions to be found in an ore milling plant was unsatisfactory.

Of the devices available, one consisted of an encased iron bell suspended on a spring and floating on a mercury pool. One pressure is brought in under the bell and the other is applied between the case and outside of the bell. Differential pressures are determined by measuring the deflection of the spring as the submergence of the iron bell in the mercury pool changes. Such a device has been shown to be unstable when vibration is severe.

A second device consists essentially of a beam balance for measuring the differential pressures. A beam balance is accurate only when in balance. When serious vibration and dust are met, such a device is not reliable.

A third device is a mercury manometer. For the measurement of 0.01 units of gravity with a three-inch bubble tube differential, the movement of the mercury column would be only 0.002 in. Obviously, considerable mechanical amplification is necessary to get a reading that can be seen for any distance in a mill. Where small mechanical movements must be amplified, there is always danger of inaccuracy due to static friction.

After much thought, it was decided that the most desirable means for measuring the differential pressures was a fluid manometer using some light fluid such as silicone or oil. Such a device would have 13 or more times the measurable movement as compared to mercury. It would not be subject to inaccuracies due to severe vibrations. The accuracy would be uniformly high throughout a wide range of values of specific gravity, and the measurement would be linear.

The light fluid manometer was made all the more appealing when means for automatically measuring the manometer electrically were discovered. Principle of operation of the novel electronic manometer developed at Combined Metals Reduction Co. is shown in Fig. 2.

In the manometer tube and floating on the light fluid is a hollow

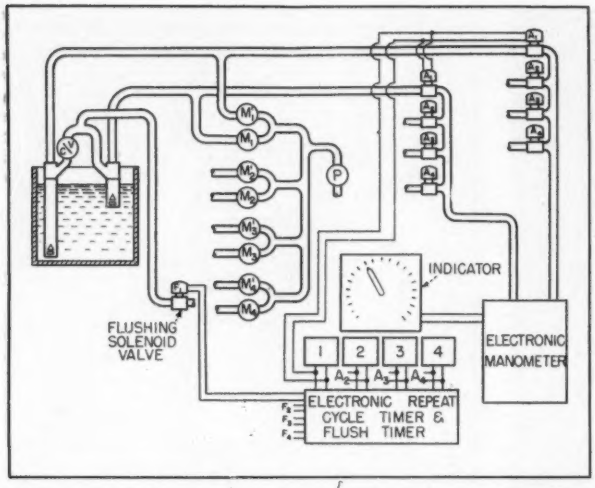


FIG. 3 . . . Complete circuit for measuring density at several points with one manometer and one dial or recorder. Tubes are self-cleaning.

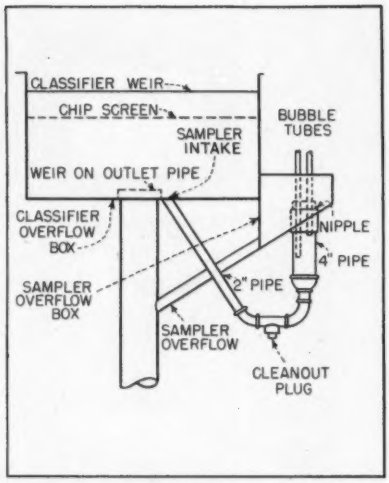


FIG. 4 . . . To avoid sanding-up in classifier, Bauer plant samples classifier overflow like this.

iron float. On a movable frame and wound so as to be coaxially around the manometer tube are three coils which form the sensing unit. These coils are shown schemetically in Fig. 2. To coil A is applied a 60 cycle alternating voltage of approximately one volt. Coils B and C are wound so that each is covered by one-half of the primary coil A and are connected in phase opposition.

Consider the sensing coils, transformer T_1, and the iron float. When the iron float is so positioned that it is exactly in the middle of the coils, that is, so that the amount of iron opposite coil B is equal to the amount of iron opposite coil C, then the alternating flux linkages between the primary coil A and coils B and C will at all instants of time be equal. Since coils B and C are connected phase-opposing, there will be no voltage developed across the primary of transformer T_1 and hence no voltage output from its secondary.

If the iron float moves upward due to a change in pressure, then the voltage induced in coil B will be greater than the voltage induced in coil C, and there will be a voltage developed across the primary of T_1.

If the iron float moves downward, then the voltage induced in coil C will be greater than the voltage induced in coil B and again there will appear a voltage across the primary of T_1, but this voltage will be 180° out of phase with the voltage that is developed when the float moves upward.

Thus, when the float is in the "balance" position within the sensing coil assembly, no voltage is developed across the secondary of T_1. When it moves out of balance due to a change in pressure, a voltage is developed that is *in phase* with the line voltage applied to the primary coil A, and when it moves in the opposite direction, a voltage is developed that is 180° *out of phase* with the line voltage. This provides a means of sensing with great precision the position of the float, and for determining whether it is moving upward or downward.

The secondary of transformer T_1 is connected to the input of an amplifier. The output of this amplifier is connected to one winding of a two-phase motor. The other winding of the motor is connected to the 115-volt a.c. line with a suitable capacitor C_1 to shift the phase 90° placed in series with this winding.

The shaft of the motor is geared to a cable drum which pays cable out from one end of the drum and and takes it up on the other end. Through a pulley arrangement this cable is connected to an indicator hand and it is also fastened to the sensing coils.

Thus, when the float is "in balance" there is no signal to the amplifier, the motor is stalled and the position of the indicator hand does not change. When the float moves upward, the voltage developed by the sensing coils causes the motor to turn in a direction to move the coils upward to follow the float until they are again in balance. The indicator hand is also moved to a new position that indicates the new reading of the manometer. The tendency is for the motor to keep the coils continuously in balance with the iron float.

A complete discussion of the electronic circuit is beyond the scope of this article. It is sufficient to state that there is no tendency to overshoot the balance point, for when the coils arrive at the balance position the motor stalls in such a way that it is actually trying to reverse its direction of rotation on each half cycle or 120 times a second. *This tendency of the motor to run in both directions at the same time keeps the motor friction broken, yet keeps it stalled at full torque. Sticking and friction are not factors in the operation of this manometer.*

The amplification of the amplifier is so great that a movement of three or four thousandths of an inch causes the motor to operate at full torque. Since the voltage *unbalance* is used, the apparatus is not subject to voltage instability. Variations of as much as 30% in line voltage have no effect on the accuracy of the measurement. The instrument will accurately and reliably measure pressure changes of 0.003 in. of water or 0.0001 lb. per square inch.

In the first of these instruments constructed, the instrument turns a selsyn generator, which in turn operates a selsyn motor allowing the indicator dial to be located at a remote location where all mill personnel may see it. The hand on the dial is about 6 in. long, which allows a scale circle of about 12 in. diameter to be used.

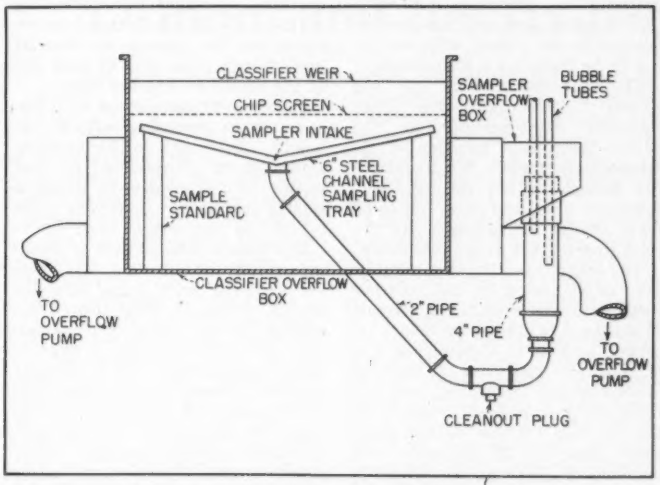


FIG. 5 . . . Pump set-up at Pioche requires different sampler on classifier. Two-inch pipe at center catches sample, which checks hand-sample results.

The first instrument constructed was installed at the Pioche mill. The manometer has given but very little trouble and operates over long periods of time without attention.

In most applications where bubble tubes have been used, extreme measures have been taken to use the absolute minimum amount of air. The almost universal attempt previously had been to have the bubble tubes emit bubbles at a rate of about one bubble per second. At the outset it was felt that this approach was impractical, for such a practice required very constant air pressure and above all an air system that had absolutely no leaks in it. When such a minute amount of air was used, the slightest leak in the air system caused inaccuracies in the instrument reading. The valves for metering the air are sometimes complex and sometimes cost upwards of $35 each. The slightest amount of oil, lint or other impurity in the air caused large inaccuracies. Such an approach had little appeal. Therefore, it was decided that a much larger quantity of air would be used. Perhaps up to 25 or so bubbles per second because then the valves need not be expensive, they would not be difficult to adjust and, most of all, air leaks of a minor sort would not be troublesome.

Soon after the apparatus was first placed in operation, two things became obvious. First, the bubble tubes would have to be flushed out from the inside to keep them clean and, secondly, means would have to be found for preventing turbulence of the pulp from affecting the instrument readings.

The solution to both these problems, as well as to the problem of a bubble tube that would allow the use of the larger quantity of air, was discovered in a simple yet unique bubble tube.

It was found that if a bubble tube was constructed as shown in Fig. 1 with the bubble-emitting orifice divided into an upper and lower part by a dividing strip, that the meniscus between the air and the fluid would be at the position of the dividing strip even for wide variations in the amount of air supplied to the bubble tube, provided the proper sized upper and lower orifices were chosen. The lower hole allows the hydrostatic pressure of the pulp to enter the bubble tube and also serves as a means for damping the meniscus. By closing the lower end of the bubble tube the effect of turbulence of the pulp is materially reduced since the turbulent force cannot directly impinge on the meniscus.

This type of bubble tube ideally lends itself to periodic flushing from the inside with high pressure water since all of the water is flushed through the orifices.

Air at 10 to 15 lb. pressure is normally used. The air is filtered first by a large home-made filter filled with cotton waste followed by a small instrument filter. *When the air volume is once set, it has been noted that air pressure changes of as much as 75% from normal have no effect on the accuracy of the instrument.*

The valves employed for metering air to the bubble tubes are the simple V-port metering valves that normally are used for metering oil in domestic oil heaters. The valves are simple, inexpensive and have the advantage that a special key is needed for changing the valve setting, which aids in discouraging tampering with the valve settings. No sight-check bubbles are needed.

Air is conveyed through ½-in. OD soft drawn copper tubing using compression fittings. Reasonable care is taken to avoid leaks in the air system, but there has been no time when the system has been entirely free from leaks, nor has any special attempt been made to avoid leaks beyond taking reasonable care to make sure that all joints have been properly tightened. No soldered joints are needed.

In order to insure that the bubble tubes are clean at all times, they are automatically flushed with high pressure water from the inside at predetermined time intervals. Experience showed that water at 50 to 100 lb. pressure formed into a jet directed against the bottom of the bubble tube was necessary to prevent encrustations from building up. To introduce water at these pressures into the system when such small differential pressures were being measured presented something of a problem.

Automatic Flushing

An electronic timing circuit was devised that would accomplish the flushing operation automatically once every six minutes. A solenoid valve operated by an electronic timer controls the flushing water. The flushing period can be varied from one to ten seconds. Solenoid valves are also placed in each of the air lines leading to the manometer. When the flush cycle is started, these valves in the air lines close, isolating the manometer from the lines into which the high pressure flushing water has been introduced. This prevents the manometer from being driven off scale while the flush is being accomplished. These valves in the air lines are held closed by a second electronic timer actuated by the first or flushing timer for a period of about ten seconds *after* the completion of the flushing cycle. By the end of this time the flushing water has been forced out of bubble tubes and bubbles are again being normally emitted, thus insuring that when the solenoid valves in the manometer air lines are opened

again that normal pressures will be applied to the instrument.

Since the electronic manometer balances very rapidly, it was decided that a single manometer could be used to measure the specific gravity in more than one place.

Multiple Measurements

As shown in Fig. 3, the manometer is connected to a manifold into which the pressures from the bubble tubes are brought. In connection with each set of bubble tubes, a pair of solenoid valves is employed, one in the short bubble tube airline and the other in the long bubble tube airline. A pair of solenoid valves is used for each set of bubble tubes employed. An indicator light is connected in parallel with each of the pairs of solenoid valves so that when a particular pair of solenoids are energized to open the valves into the manometer manifold, the indicator lamp lights up to show which pair of bubble tubes is being measured.

The automatic switching arrangement is so designed that the operating personnel by merely turning a selector switch may at any time select any combination of four sets of bubble tubes, including a single pair for measurement. For any selection that is made, the operation is entirely automatic. The apparatus cyclically switches from one position to another automatically.

In actual practice the automatic switching and flushing mechanism is so arranged that it will automatically flush the set of bubble tubes on which measurement has just been completed. Proceeding in this manner, each set of bubble tubes has considerable time, after being flushed, to return to normal before it is again connected to the manometer. The flush cycle occurs once every six minutes regardless of the number of sets of bubble tubes being employed.

The bubble tubes may be located at a considerable distance from the manometer. Bubble tubes have been located as far as 150 ft. away from the manometer with no visible loss in accuracy or reliability of the instrument. Since the instrument is adjusted to read the correct specific gravity by comparison with hand-taken samples, friction in the air lines is compensated for and causes no difficulty whatsoever.

After the Pioche installation had been in operation about a year, it was decided to construct an installation for the Bauer plant. It was decided that a recording model would be desirable. Provision was made for the measurement of the specific gravity in six places, with recording to be made on a strip chart.

The recorder chosen was the Brown "Electronik" Strip Chart Recorder manufactured by the Brown Instrument Division of the Minneapolis-Honeywell Regulator Co. because of the excellent performance that had been obtained from similar instruments used for recording the pH in the two plants.

The manometer for this installation is connected to the recorder through an electrical bridge circuit so designed that the strip chart recorder acts as a follower of the manometer. The recorder may be located at any convenient distance from the manometer. Accuracy of the follower element on the strip chart recorder in following the manometer is 1/5 of 1%, which is far in excess of the reliability of the differential pressures from the bubble tubes.

This instrument makes an observation every 30 seconds. The recorder actuates the electronic flushing timer once every six minutes.

Special Samplers

Because there was difficulty in keeping the bubble tubes from sanding in solid when some ores were milled, it was decided that it was impractical to measure the specific gravity of the pulp in the classifier pool. This made it necessary to devise means for sampling the classifier overflow for the measurement of the specific gravity. The method of sampling the classifier overflow at the Bauer mill is shown in Fig. 4.

It was found that the sampler would not sand up under normal operating conditions if a head of 2 in. was maintained on the sampler, regardless of the specific gravity of the pulp and regardless of the fluctuations in flow over the classifier weir.

The sampler always sands up when there is a power outage because of the ball mill unloading a surge of heavy pulp as flow over the weir terminates. It is readily unplugged by removing the clean-out plug and rapping the 2-in. pipe with a hammer. The bubble tubes are inserted in the 4-in. column for measurement of the specific gravity.

Careful measurements of the specific gravity of the classifier overflow have proved beyond doubt that this method of sampling gives a truly representative sample of the classifier overflow at all times.

At the Pioche plant the classifier overflow is pumped to conditioning tanks at the head of the flotation circuit so that pumps are located immediately below and at each end of the classifier overflow box.

In order to sample the overflow under these conditions without extensive alterations to the existing arrangement of overflow box and pumps, it was decided to install a sloping sample tray under the semi-cylindrical chip screen. (Fig. 5.)

The bubble tube method of measuring pulp density has not been very popular with many mill operators who have tried them. We realized at the outset that an ore pulp is a foul and messy fluid in which to maintain and accurately measure differential pressures with the accuracy of an analytical balance. We recognized that the bubble tube would be essentially a very simple device without moving parts for accomplishing this task. The problem was therefore one of inventing means of making them operate satisfactory over long periods of time. The means developed and in use for overcoming these difficulties have made the bubble tube method of measuring pulp densities practical and reliable.

At the Combined Metals Reduction Co. no attempt is being made to control the specific gravity automatically. The numerous changes in the character of the ores being processed in these custom mills make automatic control undesirable, at least at this time. The fact that a printed record of the specific gravity in several places in the plant is available to the supervisory personnel is in itself a fairly good automatic control of operations.

Why Automatic Control?

The apparatus herein described can be used as an automatic control instrument. As a matter of fact, its use as an automatic control instrument is to be recommended because of its reliability and accuracy over long periods of time. The fact that the servo balancing motor has very large power output insures that the instrument may be used to operate control apparatus without loss of accuracy due to loading the instrument with the control apparatus. *The very essence of good automatic control depends first of all on being able to measure the controlled quantity with precision and great reliability.*

The many novel features developed in connection with these instruments have been covered by applications for letters patent.

Lithium and the Hydrogen Bomb

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WHAT RELATIONSHIP is there between lithium and the hydrogen bomb? Briefly it's this: The hydrogen bomb, according to a non-classified pamphlet released by the Joint Committee on Atomic Energy in July, 1950, explains that if light atomic nuclei can be put together to produce heavier nuclei, tremendous energy would be released. This is called "fusion" and may be regarded as the opposite of "fission," which involves the breaking apart of heavier nuclei such as uranium.

The fusion reaction can take place when particles collide at high velocity or high relative kinetic energy. Thus there are two basic requirements for the hydrogen bomb: (1) The assembly of materials capable of producing a light-element reaction, if sufficiently heated, and (2) a means of heating the materials to the extent necessary. This temperature may be comparable to that existing in the interior of the sun. Today the most promising way to attain such temperature is with the atomic bomb. The intense heat released in an atomic explosion could thus set off a thermonuclear or fission reaction.

Several designs of the hydrogen bomb have been proposed. These involve two of the heavy forms of hydrogen—deuterium and tritium. Three possible reactions are listed as involving the heavy hydrogens: (1) a deuterium-deuterium reaction (that is, two nuclei of deuterium fusing to produce tritium, a proton, and energy; or helium, a neutron, and energy); (2) a tritium-tritium reaction (that is, two nuclei of tritium fusing to produce helium, two neutrons, and energy); and (3) a tritium-deuterium reaction (that is, a nucleus of tritium and a nucleus of deuterium fusing to produce helium, a neutron, and energy).

Nuclear reactors, or "piles" such as those at Hanford convert ordinary uranium into plutonium, now the basis of the so-called nominal atomic bomb as well as the stepped-up versions thereof. These same reactors, when fed lithium instead of uranium, yield a mixture of helium-4 and tritium, the heaviest of the three forms of hydrogen. The helium and tritium can be separated without too much difficulty.

Thus lithium may well take its place among those raw materials which come under Government control and ownership "to assure the common defense and security . . ." as specified in the Atomic Energy Act of 1946.

Assuming for the moment that there might be a "lithium rush," where would we find lithium?

Generally speaking, lithium is very reactive, hence it is found only in the combined state. Lithium makes up about 0.003% of the earth's crust and is widely distributed. It is more abundant than copper. Traces of lithium have been found in 140 minerals, but only a few have been exploited as ores. Rarely is lithium found in large amounts in one place.

Principal ore minerals of lithium are as follows:

Mineral	Composition	Li_2O Content
Amblygonite	$LiAl(F,OH)PO_4$	8 to 10%
Lepidolite	Lithium Mica	4 to 6%
Lithiophyllite	$Li(Mn,Fe)PO_4$	8 to 9%
Spodumene	$LiAl(SiO_3)_2$	4 to 8%
Triphylite	$Li(Fe,Mn)PO_4$	8 to 9%

Occurrences of lithium-bearing minerals and ores in the United States are as follows:

● **California.** Amblygonite has been mined at the Stewart mine in San Diego County. Lepidolite is found with tourmaline in Riverside County. Spodumene is found in Riverside County, at the Fano mine near Coahuila in the San Jacinto Mountains. The American Potash Co. at Trona is the largest producer of lithium salts.

● **New Mexico.** In 1926 New Mexico outranked all states in the production of lithium minerals. The industry center is Toas County. Here the Harding mine yields a doubtful amblygonite and large amounts of lepidolite. Lithium oxide content of spodumene found at Toas runs as high as 6.33%. Lepidolite has been found at Rio Arriba, Petaca district; also southwest of Las Vegas.

● **Colorado.** Fremont County yields natramblygonite, also fremontite $(Na, Li)\ Al\ (OH, F)PO_4$, mined near Canon City.

● **Connecticut.** Spodumene is found in Fairfield County, in pegmatite at Branchville.

● **Maine.** Lepidolite is found in pegmatite deposits at Apatite Hill, Androscoggin County, also in Wade and Pulsifer quarries at the town of Auburn. It occurs in Oxford County, at the Denton quarry, in the town of Newry, and at Mount Mica, town of Paris; also Mount Rubellite, town of Hebron. Lilac-colored kunzite (a pink variety of spodumene) is found in pegmatite at Andover, Oxford County.

● **North Carolina.** Hiddenite (gem variety of spodumene) is mined in veins in biotite gneiss at Hiddenite, Alexander County.

● **South Dakota.** Amblygonite is mined at the Bond mine in Custer County. In Pennington County, amblygonite is also mined at the Keystone mine. The Hugo mine south of Keystone is an important producer. Amblygonite is also found on the Christiansen claim near Keystone, also near Hayward in Hand County. The mineral occurs in large masses in pegmatite. Lithiophyllite occurs as large nodules in pegmatites, and has been mined in Pennington County, at the Lost Bonanza, Hugo, and Peerless mines near Keystone; also at the Dyke lode near Bismuth.

Lepidolite is found near Custer on the Beecher, Bond, and Christiansen and other claims. In Pennington County it is found in many pegmatite dikes near Keystone. It is common at the Etta, Peerless, Hugo and other mines south of Keystone; also at Wood Tin Lode, east of Keystone.

South Dakota spodumene crystals are celebrated for their size, sometimes attaining a length of 42 ft. Spodumene occurs near Custer and near Glendale. In Pennington County the best quality is found near Keystone, also near Oreville.

Many mineral waters contain lithium salts ranging from a trace to a few tenths of a percent. Lithium compounds could be extracted readily from waters carrying the higher concentrations. Two springs in Yellowstone Park carry concentrations of 0.01% and 0.013%, and two springs at Saratoga, N. Y., carry concentrations of 0.008% and 0.016%, respectively.

Brines of Searles Lake, near Trona, Calif., are the most important commercial source of lithium. Crude brines near Trona carry up to 0.032% LiCl.

Mine waters and brines or other water from petroleum drilling may carry extractable amounts of lithium. Thus brine from a well 2,667 ft. deep in Pennsylvania was found to contain 0.004% lithium.

Simple flowsheet, high-capacity units make for low-cost lead-zinc output in

New Reeves-MacDonald Mill

JOHN B. HUTTL
Associate Editor

FRUSTRATED IN TWO previous attempts, first by the depression and second by World War II, Pend Oreille Mines & Metals Co. finally completed its Reeves-MacDonald mill in April, 1949. Making use of certain innovations in mill design, the new plant has developed rapidly into one of the largest zinc-lead producers in British Columbia.

The Reeves-MacDonald mine is situated on the east bank of the Pend Oreille River, about 4 miles west of Nelway on the U. S.-Canadian boundary.

Pend Oreille Mines & Metals purchased control of the Reeves-MacDonald property from the Victoria Syndicate in 1928. Not until 1948, however, could the company's plans for the mine be put into effect. Even then, construction was hampered by slow delivery of heavy machinery and shortages of structural steel and other building materials. The mill was built in record time despite these handicaps by using machinery that was immediately available, either in the U. S. or Canada, and by using heavy timber frame construction for the mine and mill buildings. Because no structural draftsmen were available at the time, much of the plant had to be designed as construction progressed.

Ore Is Fine-grained

The Reeves-MacDonald orebody is quite large and dips at about 54°. Maximum ore width is about 80 ft. It is mined with slushers by a removable horizontal pillar and horizontal open-stope method. (See E&MJ, July, 1949.) The ore carries very fine-grained argentiferous galena and yellow sphalerite in crystalline limestone. Fine crystals of pyrite are present in about the same amount as the sphalerite.

The fine dissemination of the minerals makes relatively fine grinding necessary to liberate galena and sphalerite. The ore is not hard, tough, nor abrasive. Average grade is about 1% lead, 6% zinc, and 7% iron.

In selecting sites for the different mill units, both the steep terrain and poor foundation footings on the plant site had to be considered. As constructed, the crushing plant is in a draw below the main haulage horizon, and the main mill building is about 150 ft. higher. The higher elevation of the mill building was also dictated by the fact that back water from the proposed Waneta Dam on the river below the property would flood any structure at a lower level. The buildings are connected by two 24-in. belt conveyors.

All buildings, including the belt conveyor housings, are of wood frame construction, with the roofs and sides sheathed in aluminum. Galvanized iron was not available. Machinery in each building is easily accessible for adjustment, repair and supervision by a minimum number of men. In fact, the concentrator and crushing plant are practically two-man operations.

Overhead cranes are available in the grinding department of the concentrator and in the crushing plant. All ore storage bins are circular structures of reinforced concrete construction. Sequence of plant operations is shown in the accompanying flowsheet.

Impact Crusher Used

Ore trains, composed of 4-ton Granby-type cars drawn by electric trolley locomotives, leaving the main haulage tunnel, known as the River Tunnel, go a short distance to the unloading station, where cars

are dumped into the coarse-ore storage bin at the head of the crushing plant. The bin is 30 ft. in diameter and 40 ft. high and has a capacity of 1,000 tons.

From here, the mine-run ore goes to a center-fed 30x30-in. Cedarapids impact breaker. The vibrating grizzly ahead of the breaker has 2-in. openings. The breaker, which operates in closed circuit with a 5x12-ft. vibrating screen with 1½-in. openings, handles 175 tons per hour. It is driven by a 100-hp. motor.

Slow-Floating Ore

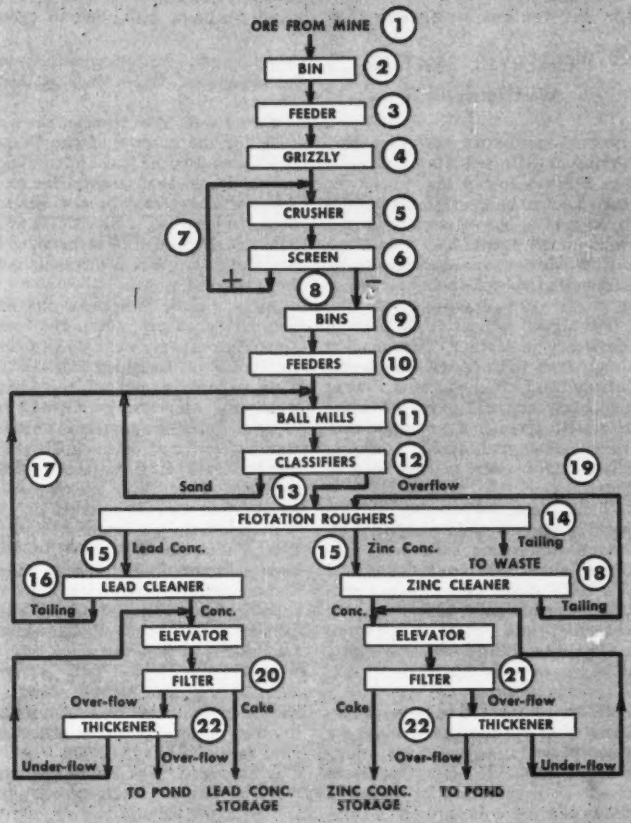
The concentrator building contains two separate treatment units of 600 tons maximum capacity each per day. Make-up of these units is as shown in the accompanying flowsheet. Note that all rougher flotation cells are oversize (48x60-in.) because of the slow floating character of the ore. Lead cleaner tails are pumped back to the ball mills, but the zinc cleaner tailings are pumped back to the head of the zinc rougher circuit. Both lead and zinc concentrate filters operate in closed circuit with thickeners.

Operations currently carried on at 1,000 tons per day indicate a 10:1 ratio of concentration. The following reagent combination is used for flotation: In the lead circuit, Aerofloat 31 and zinc sulphate are added in quantities of 0.09 and 0.19 lb. per ton. The zinc circuit receives potassium ethyl xanthate, 0.18 lb.; copper sulphate, 1.10 lb.; hydrated lime, 1.50 lb., and cresylic acid, 0.70 lb. per ton of ore treated. The pH is held at 9.9 by the lime additions.

Final lead and zinc concentrates, trucked to the Trail smelter some 50 miles distant, assay about 60% lead and 52% zinc, respectively. Water for milling operations is pumped from the Pend Oreille River to a storage tank behind and above the concentrator buildings by a deepwell pump installation below the crushing plant. Electric power is obtained from the nearby transformer station fed by the new 66,000-v. power line of Kootenay Power & Light Co. from Salmo, B. C.

Concentrator construction followed the designs of W. L. Zeigler, general manager, and the staff of Pend Oreille Mines and Metals Co. C. A. R. Lambly is general superintendent; A. F. Betchart, chief engineer; F. R. Jones, local superintendent; and H. Kipp, mill superintendent.

REEVES-MACDONALD MILL
PEND OREILLE MINES & METALS CO.



LEGEND

1. Ore trains of 4-ton Granby cars, trolley locomotives.
2. Circular, concrete bin; 30 ft. diam., 40 ft. high, holds 1,000 tons.
3. Pan feeder, 42-in.
4. Vibrating grizzly, 2-in. openings.
5. Cedarapids Dual-Impeller Impact Breaker, 30x30-in., 175 tons per hr.
6. Vibrating screen, 5x12-ft., 1½-in. openings.
7. Conveyor belts, 24-in.
8. Two conveyor belts, 24-in., totalling 600-ft. in length.
9. Two circular, concrete fine-ore bins; 30-ft. diam., 35 ft. high, each holds 1,000 tons.
10. Two belt feeders, 18-in.
11. Two ball mills, 10x8-ft.
12. Two 48-in. DDPS Akins classifiers. Overflow at 25% solids is 90% minus 200 mesh.
13. Two SRL 5x5-in. sand pumps.
14. Flotation roughers: two banks, 17 cells each, M.S. machines, 48x60-in. Six lead roughers, one cell as conditioner, ten zinc roughers.
15. Sand pump, SRL; 3x3-in.
16. Two 2-cell No. 36 Agitair lead cleaners.
17. Wilfley-type sand pump, 2-in.
18. Two 4-cell No. 36 Agitair zinc cleaners.
19. Wilfley-type sand pump, 2-in.
20. Disk filter, 3-disk, 6-ft. diameter.
21. Disk filter, 6-disk, 6-ft. diameter.
22. Thickener, 24-ft. diam.

The Gold Tide Ebbs

Why is gold leaving the United States, and who is getting it? Mr. Bratter has an answer that should reassure believers in gold.

HERBERT B. BRATTER
Washington, D. C.

ON THE PASSENGER LIST of a ship leaving the United States recently was a heavy-footed individual who turned out to be wearing about 13½ lb. of gold in the soles of his shoes. Government agents also found that this fellow and his traveling companion had packed their belongings in gold-lined suitcases.

Far from indicating a lack of confidence in leather, this incident simply adds to the proof that people outside the United States still want gold badly and will pay a premium to get it. Even in Communist-controlled Shanghai, gold hoarding exists and a black market in gold flourishes.

Uncle Sam, of course, is the world's biggest gold hoarder, although Americans have been prohibited since 1933 from using gold as a store of savings. One can predict mathematically almost the day when there will be left no one at all in the United States who ever found an eagle, or a double eagle, in his Christmas stocking.

Yet there appears to be no weakening of the American willingness to accept gold in payment for American exports. In fact, we have grown so accustomed to seeing a steady flow of gold into the Treasury's vaults that it comes as quite a shock to find the flow in the other direction.

We're Losing Gold—For more than a year, an unprecedented outflow of gold has prevailed. Treasury holdings, outside the stabilization funds, have shrunk by $1,587,000,000 (44,000,000 oz.) during the 14 months ended Nov. 15.

Not that our stockpile of gold is getting low, by any means. As of Nov. 15, the Treasury's general fund held $23,100,000,000 in gold. But it does puzzle many people to find the outside world taking large quantities of gold from us at the very time we are called upon to furnish substantial economic aid to these foreign countries.

One might well conclude that a world able to command $1,587,000,000 of gold from us in 14 months is no longer struggling with a dollar shortage. How does it come about?

First, in point of time, of the reasons for the outflow of the Treasury's gold was the wave of currency devaluations that began in midsummer 1949. Led by the British pound, a long list of currencies were officially cheapened in terms of gold and the dollar. Local prices of gold were thereby raised.

As a result, American imports became cheaper overnight and American exports went up in price, in terms of devalued currencies. This, in turn, cut down foreign payments for American goods, and increased American payments abroad, thereby cutting down gold shipments to the U. S. to settle trade balances. That, after all, was what devaluation was supposed to do.

In addition, government limitation of imports from the U. S. has been a factor in Britain and other Commonwealth countries. Moral pressure and exhortation by governments in other dollar-scarce countries has had the same effect. A writer in *Lloyds Bank Review* estimated recently that spending had been switched from American to other nations' products at an annual rate of $4,440,000,000.

A strong U. S. demand for raw materials from foreign countries works in the same direction. Even before the Korean outbreak, demand for imported raw materials was strong. After Korea, there began a scurrying for scarce materials that boosted prices of such commodities as wool, tin, rubber and cacao. Much of these commodity imports had to be paid for in dollars, creating a further drain on our gold hoard.

Tracing Gold Movements—From the gold miner's standpoint, special interest attaches to the destination of newly-mined gold, whether it is taken by governments and central banks, or by industry, or whether it reaches private hands at premium prices. On the other hand, official institutions, dealing with international payments, regard bank balances in U. S. dollars as good as gold, because the U. S. stands ready to convert such balances into gold, at least for central banks and governments if not for its own citizens.

That's why gold and dollar holdings are often lumped together in official statistics, making it extremely difficult to trace gold movements about the world.

For example, the latest data on the United Kingdom's holdings lump gold and dollars together. Moreover, the British Treasury's and Bank of England's Canadian-dollar balances are excluded.

Again, gold held under earmark for foreign central banks is part of the reserves of such banks and is no longer part of the reserves of the country where the gold is physically located. A large amount of gold is thus held at the Federal Reserve Bank of New York under earmark for foreign account.

The Federal Reserve Board publishes only a single monthly figure for earmarked gold, embracing all the gold held in Federal Reserve banks for the account of foreign governments and international institutions. At the end of September, 1950, $5,206,000 of gold was so held. Obviously, distribution of U. S. gold due to acquisition of the metal by foreigners is to be followed not only in the country's foreign trade statistics, but in changes in earmarking.

Earmarked Gold—Gold belonging to foreigners may be left under earmark in the Federal Reserve banks because it is expected that the owners may have to sell it to raise dollars, or because it is regarded as safer to leave the gold here than to take it abroad. However, in this atomic age even New York may not be the safest overseas haven for European gold.

As was demonstrated in 1932 and 1933, a flight of capital from this country in anticipation of an increase in the price of gold is reflected in an increased outflow of the metal, including increased earmarkings here for foreign account. However, such consideration has hardly been a large factor in 1950.

Since 1942 there have been only two years in which foreign gold under earmark in the Federal Reserve Bank has not increased: 1946 and 1947. During each of the 14 months from September, 1949, through October, 1950, earmarked gold in the U. S. increased. The largest such monthly increase occurred in

August, 1950: a net change of $431,400,000.

An accompanying table shows the changes in the U. S. gold stock since September, 1949, including both that in the Treasury's general fund and in its stabilization fund. It will be noted that the net decline in the Treasury's gold holdings has been fairly closely paralleled by increases in gold earmarked for foreign account. The fact that during the period covered by the table, physical imports of gold into the U. S. A. exceeded exports suggests that some gold was sent here to be held under earmark.

The import statistics include gold in ore and base bullion sent here for refining. Some of this is legally re-exported after refining and thus is just in transit. It does not appear in the figure for Treasury holdings. Nor is transit gold, obviously, part of the earmarked metal.

Gold, other than transit gold, must be sold to the Treasury at $35 an ounce upon importation, unless it has been licensed for industrial use. With the insignificant exception of gold in its natural state, all newly-mined domestic gold also must be turned over to the Treasury at $35 an ounce. Efforts to promote a domestic market for natural-state gold at premium prices have had indifferent success. Practically the whole of the domestic mine output is believed to find its way promptly into the Treasury, unless licensed to be sold directly to industrial users.

In the table, therefore, the statistics on Treasury holdings are net, after giving effect to all inflows and outflows on governmental and private account, excepting transit gold, and to domestic mine production and industrial consumption.

Who Has the Gold?—Who got all the gold which has been given up by the Treasury? The money market editor of the *Financial Times* (London) did some rough pencil work on this topic and published the results on Nov. 2, 1950. After pointing to the more than $1,100,000,000 shrinkage in the U. S. gold stock during the twelve months following the wave of currency devaluations in September, 1949, and to mine production outside the USSR totaling about $500,000,000 during the same twelve months, the paper reports that far and away the largest net buyer of this $1,600,000,000 of gold was the United Kingdom. Its net gold acquisitions are estimated at $800,000,000, apart from more than $500,000,000 of newly-acquired dollar balances. This accounts for half of the $1,600,000,000, or nearly three-fourths of the above-mentioned $1,100,000,000 which the United States lost.

Other gold additions, as estimated by the *Financial Times*, are given in Table II. Unable to account for $150,000,000 of the above $1,600,000,000 plus some $60,000,000 of the metal withdrawn from Belgium, the London journal hazards the guess that a "sizable amount" of gold was absorbed during the post-devaluation year by the French Stabilization Fund.

Certain official statistics on changes in gold holdings during the year following the 1949 devaluations may be obtained in the World Fund's *International Financial Statistics*. These are set down alongside the estimates of the *Financial Times* in Table II.

Bundles for Britain—The latest official figure for British monetary reserves is that for September 30: $2,756,000,000. This includes gold, U. S. dollars and Canadian dollars. An official breakdown is not available. The year-end totals since 1946 are given as follows:

1946.....	$2,696,000,000
1947.....	2,097,000,000
1948.....	1,856,000,000
1949.....	1,688,000,000
1950 (Sept.).	2,756,000,000

On September 30, 1949, just after the devaluation of sterling, the U. K.'s gold and dollar reserves stood at only $1,425,000,000. Parenthetically, it is pointed out that the gold and dollars officially held by the Bank of England represent the reserve of not only the United Kingdom but of other sterling-area countries as well.

During the period of decline and recovery of British gold and dollar reserves in the 3¾ years since 1946 the United Kingdom received massive financial aid from North America, quite apart from that extended to other members of the sterling area. According to official U. K. data, Britain received the $3,750,000,000 American loan, repayment of which is supposed to commence next year; $2,494,000,000 of ECA gifts; $1,159,000,000 of Canadian credits; $420,000,000 from the International Monetary Fund, and $325,000,000 as a gold loan from South Africa. This makes a grand total from these items alone of $8,148,000,000. It would seem to follow that, without these gifts and loans, British gold and dollar reserves would long since have disappeared. During the year ended

(*Continued on page* 128)

Table I—How U.S. Gold Stocks Declined Since September, 1949

(in millions of dollars)

End of	Held in Treasury general fund	Held in general and stabilizations funds: Amount held	Held in general and stabilizations funds: Change since Sept. 1949	Net import	Change in gold earmarked for foreign account and intl. institutions
Sept. 1949....	24,602	24,728	....	...	.....
Sept. 1950....	23,483	23,591	—1,137	36.1	+1,145.4
Oct. 1950....	23,205(p)	23,349(p)	—1,379	98.1	+1,291.6*

Source: Federal Reserve Bulletins, Oct. and Nov., 1950; Commerce Department, Statement No. 2402 of November 28, 1950.
(p)—Preliminary.
*Total under earmark Oct. 31, 1950—$5,352,500,000.

Table II—Increase in Foreign Gold Holdings, September, 1949-September, 1950

(in millions of U. S. dollars)

Holder	Estimate of the Financial Times	Official data in International Financial Statistics
United Kingdom	800	*
South Africa...	100	58
Canada	50-100	93
Netherlands	70	69
Bank for International Settlements ..	70	77(Oct. 1949-Aug. 1950)
Switzerland	50	44
Egypt	50	*
Thailand	40	40 (through April only)
Colombia	20	18 (through May only)
Uruguay	20	31 (through Aug. only)
France	**	*

*Not reported.
**A sizable amount.

KEEPING TAB ON PRACTICE

Carbide Drilling With Air-Leg-Mounted Light Machines Is Proving Useful at Various Canadian Mines

SATISFACTION is expressed by several Canadian mining companies with the drilling results obtained by using the combination of light air-leg-mounted rock drills with tungsten carbide as a drilling medium. The carbide may be used in the form of tips on bits forged on the rods, or as inserts in detachable bits. These companies also indicate their intention to continue such use, if not to increase it. Notes on their individual practice are given in the following:

Lamaque Mining Co., Ltd. This company, at Bourlamaque, Que., has increased its tons-broken-per-man-shift by as much as 50% and cut the labor cost of breaking 37% with the new equipment—and drill maintenance cost per foot drilled is lower, according to P. B. Everest, general superintendent. Lamaque has 18 RH 655W Atlas-Diesel machines with pneumatic pushers. The drill weighs 42 lb., has a 2⅝-in. piston diameter. Air consumption is given as 86 cfm. Best air pressures are 90-100 psi.

Six RH 656W drills are also in use. This machine is like the others but is used with a pusher having a piston with a large face diameter. It is designed for drilling with lower air pressures and for giving the footages obtained with the RH 655W at higher pressures. Additional machines are being bought for shaft sinking.

Rods are of ⅞-in. hexagonal section with a chisel-type bit forged on the end, fitted with a carbide insert. They are purchased in the following lengths: 2.65 ft., 5.25 ft., 7.9 ft., 10.5 ft., 13.15 ft. and 15.75 ft. Bit diameter decreases from 1.34 in. to 1.14 in. The number of pieces in a set depends on the length of drill hole.

Footage drilled with this equipment in August and September, 1950, was 33% of the total and 67% of the footage drilled for stoping purposes. All development footage was drilled with drifters and stopers using carbon steel and detachable steel bits. The latter equipment was also used formerly for the drilling now done by the Atlas-Diesel equipment.

Life of the carbide-tipped rod end averages 400 ft. The maximum should be over 450 ft. but has not been noted.

To lengthen the life of the carbide-tipped rods, the use of a carbide insert of greater depth is being considered, also the use of a detachable carbide bit on the rod after cutting the worn bit off. Neither idea has been adopted as yet.

In addition to increasing output per man-shift and reducing costs, the use of the lighter machines is said to have made the miner's work easier and improved his morale. The light equipment with the jack leg is also more versatile than the old equipment and can be used under a greater variety of conditions. It is also said to be cheaper in first cost.

Golden Manitou Mines, Ltd. Andrew Robertson, general manager of this company, which is 10 miles east of Val d'Or, Que., is doing 90% of his drilling with the light equipment. He has four of the RH 655 drills (described in the foregoing) and one Gardner-Denver 5-48. Both machines use the carbide-tipped Coromant rods, of ⅞-in. hexagonal section. There are three pieces to a set, the lengths being 5¼, 10½, and 15¾ ft.

Up to late October, the best average footage obtained per month had been 320 per rod, compared to about 100 ft. less with the power-feed machines previously used. Rod life has been increased by grinding the bit to a flatter taper than recommended. The equipment is regarded as excellent for stope drilling.

Hollinger Consolidated Gold Mines, Ltd. According to E. L. Longmore, general manager, the Hollinger company at Timmins, Ont., is experimenting with jack-leg mounted drills of several makes, using carbide-tipped rods supplied by Atlas-Diesel. An average footage of 300 per rod has been obtained, and a maximum of 600. This figure is based on a limited amount of drilling in hard ground only. Some cost reduction has been effected in drilling such ground in drifts and stopes. A general reduction in drilling costs in all ground is anticipated if the equipment proves successful for operation as a one-man machine and bit costs can be lowered.

Senator Rouyn, Ltd. At this property in the Noranda area, Quebec, all drilling is being done with air-leg-mounted drills, of which there are 16, using Swedish rods for the most part. Some steel of Canadian make is also in use. With 350,000 ft. of drilling as basis, J. C. Houston, general manager, says the machines are definitely replacing former drilling methods where the rocks are not too siliceous. Cost per ft. drilled is satisfactory, especially when rock-drill write-offs and maintenance are considered.

Footage averaged per rod is 450, being much higher in one month owing to the rock drilled.

The rods are of ⅞-in. hexagon section with a collar and Series I gage. Lengths are (approximately) 3, 5, 7, 10 and 15 ft. Two are usually required (5- and 10-ft., or 3- and 7-ft., or 5- and 7-ft.) and occasionally the 15-ft. length.

Equipment previously used comprised power-feed drifters, with ⅞-in. quarter-octagon Vibresist steel, and single-pass bits.

Anacon Lead Mines, Ltd. This company, at Montauban les Mines, Que., is doing 80% of its drilling with air-leg-mounted equipment, according to Douglas Parent, manager. This combination they consider natural for their type of orebody. They expect to use it for all drilling in stoping and shaft sinking, also for secondary breaking at drawpoints.

The drill used is the Atlas RH 655W, with the BMK 41A2 pusher. Half-inch rods are used in six lengths, ranging from 2.65 ft. to 15.75 ft. Average footage per rod has been 400 over an eight-month period, with a maximum of 1050 ft.

East Malartic Mines, Ltd. Experience with light air-leg-mounted drills and tipped steel is as yet limited, according to T. V. Nethery, mine superintendent, but the performance has been satisfactory. Continued use is expected. Ten RH 655W machines, complete with long and short pushers and long and short extensions with supports, are in service. Four of these are working in the 61° inclined shaft now being sunk. Recently the 3½-in. power-feed Leyner-type drills that were in use in the shrinkage stopes have been replaced. Eventually all subdrifting will be done with the small machines.

Belleterre Quebec Mines Ltd. J. K. Godin, mine superintendent (at Belleterre, Que.), states that about 30% of the holes in stoping and 25% of those in drifting are drilled with air-leg-mounted equipment. He regards it as very promising. Average footage per carbide-tipped rod is 160 and the maximum 225 ft., over six months. This is better than obtained with the 3½-in. power-feed machines and conventional mountings formerly used. A rod life of about 400 ft. is

obtained with the ⅞-in. hexagon alloy tipped steel, compared to 150 ft. for the 1-in. quarter-octagon steel in the 3½-in. drifters.

Equipment used with air legs comprises four Joy LM-47 drills, with JAL air leg; one Gardner-Denver S-48 sinker, with FL-2 leg; and one Atlas RH 655W.

Sigma Mines (Quebec) Ltd. This company (Bourlamaque, Que.), according to J. B. Redpath, assistant general manager, is doing 14.7 of its total drilling with the light machines and carbide-tipped steel having the chisel-type bit. Increased productivity per manshift has resulted. Steel costs are somewhat higher than with conventional steel but there is an over-all reduction in rock-breaking costs. The steel has not been used successfully in drifting.

The drills comprise 16 Atlas-Diesel RH-655 W machines and, on trial, one Gardner. Twelve of these drills, equipped with air-legs, are used in stopes, and the other five in shaft sinking. Coromant hexagon steel, ⅞ in. in diameter and having a chisel bit, is used in six lengths ranging from 2.65 ft. to 15.75 ft.

Average footage obtained per rod in drilling 119,685 ft. from Sept. 17, 1949 to Oct. 4, 1950, was 212.6 ft. in "abrasive" rock, 306.5 ft. in "Non-abrasive." The over-all average was 243.3 ft. and the maximum 574 ft. By collaring broken shanks an additional 110 ft. was obtained. The ultimate rod life of these rods with light machines is unknown. When the carbide insert was used up, an additional footage up to 800 ft. was obtained, using detachable carbide bits.

Granby Consolidated M.S.&P. Co. According to R. S. Douglas, mine superintendent, at Copper Mountain, Allenby, B. C., 100% of the drilling in development headings is being done with 12 Atlas RH 655W machines, using ⅞-in. hexagon-section rods. The latter are bought in four lengths, namely, 2.65 ft., 5.25 ft., 7.9 ft. and 10.5 ft. Three pieces are used in a set.

The light machines and tipped rods are excellent, Mr. Douglas thinks. Footage advanced per shift had increased 60%. Average footage of hole drilled per rod is 600, the maximum to date being over 2000 ft.

Two Other Canadian Companies. Two operators in the Dominion, who have been using air-leg equipment with carbide-tipped steel, prefer to remain anonymous. Both think their experience has been too limited as yet to justify definite conclusions.

One of these companies has been doing only about 4% of its total drilling with the equipment mentioned—work confined almost wholly to lateral development. The equipment comprises four Atlas drills, three of them RH 655W machines with BMK 41 pushers, and the other a RH 656W, with a BMK 42 pusher. Rods are of ⅞-in. hexagonal section, purchased in four lengths, namely, 2.5 ft., 5.25 ft., 7.9 ft. and 10.5 ft. Corresponding bit gages, in the two series used, are: Series I —1.34 in., 1.30 in., 1.26 in., and 1.22 in. Series 4—1.58 in., 1.54 in., 1.50 in., and 1.46 in.

A set consists of one 5.25-ft. rod and one 7.9 ft. long. Development headings with two machines are supplied with five sets of Series 1 and three sets of Series 4, with one 2.5 ft. rod and one 10.5 rod per drill.

This company expects to have to drill much harder ground eventually and appears to be exploring the possibilities of the carbide-tipped steel.

Average footage to date with the tipped rods is 380 ft. The maximum was 764.4 ft., obtained with a 5.25-ft. Series I rod, over one month.

Standard drilling equipment for this company comprises 3½-in. crank-feed Leyner-type machines in stopes, and power-feed machines of the same size and type in certain development headings, both using 1-in. quarter-octagon steel and single-pass steel bits. In certain other development headings where the ground is harder they are using 3-in. power-feed Leyner-type machines with ⅞-in. steel and stud-type carbide bits.

The other company of the two mentioned is doing 20% of its stoping with its light equipment. This comprises 6 Atlas RH 655, 4 I-R J 40, and (on trial) 2 Gardner-Denver S48 drills. The machines are not used in development driving. During a seven-month period 325 ft. of hole was obtained per rod, on an average, the maximum in any month being 374 ft. Steel cost per ft. drilled is higher but stoping efficiency is better.

The tipped rods the second company uses are:

Stoping—Two rods, one 5.25 ft. long and of 1.30-in. gage, and one 10.5 ft. long and of 1.22-in. gage.

Sub-level drifting—Two rods, one 5.25 ft. long and 1.30-in. in gage, and one 7.9 ft. long, of 1.26-in. gage.

Slashing—One rod, 13.1 ft. long and 1.18 in. in gage, to complete hole.

Eye-bolt drilling—One rod, 2.65 ft. long and of 1.58 in. gage.

Equipment supplanted by the light machines consisted of 3½-in. Leyner-type drills with 1-in. quarter-octagon steel and single-pass steel bits. These drills were also used in development work, together with 3-in. Leyner-type machines and detachable carbide bits.

This operator expects to increase the rod life by putting on a detachable bit when the tip is worn out.

Use of the light drills and tipped rods represents an advance over the bar-mounted drills for stope work. The air-leg machines are expected to be used to an increasing extent, possibly replacing the Leyner-type machines entirely in stopes. Use of the carbide-tipped rods, however, is expected to decrease in favor of a detachable bit attached to a similar rod, to get the latter's maximum life. The cost of drilling with detachable bits appears to compete favorably with that of carbide-tipped rods.

Consolidated Beattie's Unusual Set-Up. R. S. Haflidson, chief engineer for Consolidated Beattie Mines Ltd., at Duparquet, Que., says they have a somewhat unusual set-up in that the ores at their No. 1 and No. 2 shafts are entirely different in drilling and bit-wear characteristics. At No. 1, the rock is silicified grey porphyry, medium hard and not very abrasive. At No. 2, it is silicified breccia, very hard and abrasive. Average figures for both shafts mean little, so it is necessary to include both shafts in discussing the drilling. Moreover, instead of carbide-tipped rods the tungsten-carbide detachable bit is used with ⅞-in. steel shanks, which combination is found preferable for the prevailing condition.

Equipment used is: Machines are principally the Holman Silver Bullet, 2⅝-in. bore, 57-lb. machines, although Rand J-50 (also 2⅝-in. bore) machines are being tried. Air legs are of three makes—Holman, Gardner-Denver and Rand; all satisfactory. Bits used are Holman four-wing carbide-insert Holbits in four sizes, starting with a 1½-in. diameter bit and reducing 1/32 in. between consecutive sizes. Shanks (or rods) used are forged at the mine from ⅞-in. Atlas Chippewa quarter-octagon drill steel and are made up in lengths up to 20 ft.

Forty percent of the drilling is done with light equipment at No. 1 shaft and 75% at No. 2 shaft, with the percentage increasing as new equipment is bought.

Equipment used previously and still used in some of the softer ground is an automatic-feed drifter, a 3½-in. bore machine equipped with a standard 4-in. column bar, arm and dump. Bits used with this equipment are single-use steel bits, in seven sizes beginning with 1⅝-in. diameter and reducing 1/16 in. between sizes.

Average footages per bit for tungsten-carbide bits for No. 1 and No. 2 shafts for 1950 are 270 and 181 ft., respectively, with the maximum 500 ft.

Rod life has doubled using the light equipment since the machines are smaller and wear and tear are less. Comparative rod costs per foot drilled are as follows: Old equipment—1.8c; light equipment—1.0c.

Results with the new equipment are regarded as extremely favorable by Mr. Haflidson. Overall costs for bits, shanks, machine repairs and drilling labor used to be 35c per foot drilled in stopes with the old equipment, whereas they are now 26c, a reduction of almost 30%. This, along with a general efficiency drive, has resulted in total stoping costs at No. 1 shaft dropping from $2.54 in 1949 to present costs of $1.61. The company expects to increase use of light machines and carbide bits.

WASHINGTON REFLECTIONS

Seabrook Hull, McGraw-Hill Washington News Bureau

Wilson of GE Takes Top Production Job

Tougher, but better planned, controls are certain to result from President Truman's creation last month of the Office of Defense Mobilization under the direction of General Electric's C. E. Wilson, and the declaration of a national emergency.

ODM under Wilson will be more powerful than anything created during World War II. It can best be compared with last war's Office of War Mobilization except that OWM was primarily a coordinating agency. ODM is that and more. The President's order that created Wilson's job said that he "shall direct, control, and coordinate all mobilization activities of the Executive Branch of the Government. . . . (He) may perform the functions through such officers and such agencies and in such manner as he shall . . . determine . . . (and) to the extent that any provision of any prior executive order or directive is inconsistent with the provision of this order, the latter shall control."

Next to the President himself, it makes Wilson the most powerful man in Washington. He's already being spoken of as the assistant President in charge of the home front. He has Truman's full backing.

Immediately, Wilson in his new job won't mean anything startling, except that he, instead of Symington will be calling the control shots from here on. Most of the defense agencies now in existence, like National Production Authority, the Defense Minerals Administration, etc., will continue to handle administrative details and carry out Wilson's policies.

Later, however, there'll probably be some major changes as all of these agencies are brought under central control.

Here's the sort of thing that can be expected to happen over the next several months as Wilson gathers his staff (to run into thousands of new Government personnel) and takes hold of his new duties.

ODM itself will have a relatively small staff. It will be the top policy planning and management organization. Under it, however, there will be (1) a production agency—containing all the controls now spread among Commerce, Interior, Agriculture, and the Interstate Commerce Commission; (2) a price-wage stabilization agency —the one headed by Valentine, and (3) a manpower agency, yet to be created.

In effect, it means that cabinet officers Sawyer, Chapman, and Brannan are Wilson's subordinates when it comes to what will or will not be done in the way of economic, manpower, and materials controls. This is especially true until ODM is built up enough to absorb the various mobilization offices now located in the several departments. It will still be true to a large extent even after that.

Of special interest to the mining industry is Interior's Defense Minerals Administration. Long range, its future is easy to predict. It will become a part of Wilson's organization. When it does, some of the Bureau of Mines personnel now operating it will go with it. Meanwhile, Interior Secretary Chapman, through Dr. James Boyd, will retain nominal control. But ODM will set the policies.

Actually, change in top-level control, may not make much difference to DMA right away. Even before Wilson came along, someone on a higher level than DMA, either Symington or Chapman, reserved control over the important decisions that had to be made. For instance, Symington had the final say on defense production loans and accelerated amortization. Chapman reserved to himself the right to make all important decisions of the Interior agencies. Probably this unworkable arrangement had much to do with the resignation of Assistant Secretary C. Girard Davidson, who is leaving to practice law in the Pacific Northwest.

During the present interim period, operating conditions will improve, if anything. Chances are that in the interests of efficiency and speed, Wilson will see that discretionary powers are granted directly to DMA, to be applied in accordance with top policy laid down by Wilson and ODM.

There's considerable hope that creation of ODM will speed action on the growing numbers of applications for loans, long-term purchase contracts, and accelerated amortization that have been piling up since DMA was set up. This does not mean, however, that final completion of contracts will be other than a slow process. After negotiators have agreed, both the agency's own lawyers and the General Accounting Office will have to approve contracts, in addition to the lawyers of other agencies which have a finger in the pie.

Despite confusion in recent weeks over the method, extent, and speed of mobilization and controls, some progress has been made in setting DMA up as an operating agency. In the Supply Division, headed by S. H. Williston, Otto Herres, V.P., Combined Metals Reduction Co., takes over the Lead-Zinc branch. James K. Richardson of Kennecott Copper Corp. is in charge of the Copper branch.

More Control Orders Are Issued by NPA

During December the National Production Authority issued new control orders affecting zinc, cadmium, nickel, copper scrap, and tin.

The zinc order, M-15, limits consumers, except for DO orders, to 80% of their average consumption during the first 6 months of 1950. The order applies to the first quarter of 1951. Maintenance and repair uses are held to the base-period level. Users of less than 1000 lb. per month are exempt. Consumers are limited to a 45-day or practicable minimum inventory.

To prevent a complete dearth of cadmium in non-defense uses, NPA ordered suppliers to fill only 50% of defense orders on hand and received in January. The remainder is to be prorated among non-defense users. Full allocation is anticipated.

The copper-scrap order, M-16, prohibits the disposal of scrap except by specific authority of NPA. Accumulation of "excessive" inventories is forbidden. Dealers are limited to their base-period level of inventories. Toll treatment is allowed only with NPA permission. The order caused a collapse of the inflated scrap market.

Nickel consumption (primary), per order M-14, is limited to 65% of the base-period average and a 30-day inventory in the first quarter of 1951.

The tin order will require consumers to limit themselves to 80% of base-period use, effective Feb. 1, 1951.

It is anticipated that as rapidly as they can be formulated, orders will be issued limiting the use of scarce metals in particular applications and prohibiting certain end uses. These orders will be applied gradually, to avoid unnecessary hardships and will finally merge into a Controlled Materials Plan, effective about mid-year.

NPA has split its minerals group into an Iron and Steel Branch, including ferro-alloys, a Light Metals Branch, a Copper Branch, a Lead-Zinc-Tin Branch and contemplates a Miscellaneous Minerals unit as soon as it can be organized.

ESA Price Freeze May Roll Back Raw Material Costs

As an upshot of the big auto makers' rejection of a request to cancel recent price increases, the Economic Stabilization Agency in late December issued a "voluntary" price freeze asking industry to hold prices in line with Dec. 1 levels. Although compliance is voluntary and enforcement machinery is in a rudimentary stage, those who

refuse to cooperate can expect to find themselves subject to compulsion.

The ESA freeze applies primarily to manufactured goods. However, the statement virtually promised manufacturers that ESA will hold down raw-material costs in consonance with such price levels, in regard to raw-material price increases which occurred since June 24, 1950. This promise presents some difficult questions, as the relationship of raw-material costs to product costs is variable, both between various industries and different producers in the same manufacturing industry.

Relief is provided in hardship cases.

International Control of Materials Planned

Government buying for industry of some imported metals and other raw materials will be started right away. Rubber is first on the list. General Services Administration is ready to step in as sole buyer. Private buyers will continue to operate as GSA agents. GSA will foot the difference between the world rubber price and the domestic controlled price when it is announced. This is likely to be the formula for other items such as tin, copper and wool.

International allocation will be negotiated, but results are not likely before the middle to the end of this year. Producing countries in most cases are holding out for substantial concessions. They want price controls and availability guarantees on the essential U. S. exports they want to buy. They want minimum prices fixed for times when demand is low. They want controls in the consuming countries to make sure their raw materials really go into defense and essential civilian production. A combined raw-materials board—like the wartime Anglo-American Raw Materials Board—is being formed. Prime Minister Attlee recommended that the U. S., the U. K., and France be the sole members. But the U. S. objected. Washington wants Latin America, India or some other Asian country, and Canada or Australia represented in addition to the U. S. and Western Europe. Such an authority is bound to be unwieldy. The real negotiating will go on inside commodity study groups. Such groups already exist for wool, tin, rubber, cotton, wheat and sugar. A lead, zinc, and copper group or groups may be formed soon to lay the groundwork for future allocation as necessary.

As of Oct. 1, 1950, British authorities have restricted consumption of zinc in the United Kingdom to 90% of the amount consumed in 1949. Shortage in supply and increased use for the defense program brought on this action. To assist the British to obtain needed zinc for the emergency, the authorities in Washington have asked several smelters to switch some of their forward stockpile commitments to the Ministry of Supply.

LABOR THIS MONTH

Joseph M. Gambatese, McGraw-Hill Washington News Bureau

DEFERMENT IN MINING?: All-around underground metal miners have been added to the list of critical occupations used by the military services in granting six-months delays in calling reservists and National Guardsmen. List is not being used, yet, in the draft.

DRAFT: It's going to bite deeper under present goal of 3.5-million military force. Men under 26 will be hard to hold. Congress may change law to draft 18-year-olds before tapping war veterans now exempt and veterans may go before draft age is raised. January-February quota of 90,000 has jumped to 160,000. Later calls will be as high, or higher.

SCIENTISTS: Dr. Charles A. Thomas, Monsanto Chemical's executive vice president, will help make draft policy for scientific and engineering personnel. He's chairman of NSRB Scientific Manpower Advisory Committee, assisted by Dr. Philip N. Powers, former AEC advisor.

ANOTHER WMC?: All manpower activities, possibly even selective service, will be put into an independent agency under defense mobilizer Wilson. Something like the War Manpower Commission. It will have big voice on draft policies, try to balance military and defense production needs for skilled and scientific personnel.

SPLIT: Top educators are divided on what to do with high-school graduates. Six educational committees advising draft director Hershey think students with high aptitude and scholastic standing should be deferred temporarily to pursue college courses in scientific and other professional fields. These students would get draft classification II A (S).

UNIVERSAL SERVICE: Different view comes from "Committee on the Present Danger," headed by Harvard's Conant and Vannevar Bush. It favors universal military service, including training, for two years for all boys of 18 or on graduating from high school. Then they could begin college training, uninterrupted.

PENTAGON: It leans toward universal military service and will get a hearing in Congress. Passage is just a possibility, not probable. It would supplment draft, put all 18-year-olds in uniform. Less fit would not have to fight, maybe fill desk jobs.

HAZARDOUS JOBS: Metal mining occupations, with some exceptions, are declared hazardous by Secretary Tobin under the wage-hour law, effective Jan. 6. That makes 18 the minimum age on those jobs. Some exceptions: work in offices, warehouses, laboratories, above-ground surveying, repair, cleanup.

WAGE FORMULA: Government is going to let wages rise with the cost of living. It will put more pressure on prices to hold BLS price index down, less on wages. That is how the wage stabilizers were thinking at year-end. What you will get, then, is a "Big Auto formula"—the General Motors pattern—to take the place of last war's Little Steel formula.

STEEL: Steel's 10¢—16c—fifth-round boost put steel ahead of auto workers, but the GM formula can push auto wages ahead of steel before year's end. So Philip Murray will want more next December.

CRACKDOWN?: Trend of mobilization, bigger war, can upset soft wage-control plans. Defense mobilizer Wilson can get tough if he wants. As Byrnes did in April, 1943, when he issued "hold-the-line" order to War Labor Board.

IRON MINE WAGES: Note extra wage increase of 8½c an hour U. S. Steel gave Minnesota iron ore miners to reduce differential. Southern differential also was cut from 14½c to 10c.

GRIEVANCES: You can't let one union handle a grievance when the employee involved is represented by another union. NLRB says Miami Copper Co. at Miami, Ariz., and Inspiration Consolidated Copper Co. at nearby Inspiration, violated the Taft-Hartley law in this respect. The companies, under threat of strike by Mine, Mill and Smelter Workers, let Mine-Mill intervene in a grievance situation, although the employees involved were in units belonging to the machinists and AFL electricians unions.

LEFT-WING: Seeds of a third labor federation of left-wing unions kicked out of CIO were sown at a Washington conference. A formal organization has not materialized, but it will. Union executive boards will meet again for "joint action." Mine-Mill spokesmen are right up front, led by the ex-communist, Maurice Travis.

MINE-MILL VS. STEEL: Travis claims Mine-Mill has successfully fought off raids by Murray's steel union. Out of more than 100 locals raided, steel was able to pick off only a few small, and rather new, locals. Travis so boasts in an article, "Mine-Mill Stands Up," in "March of Labor," a left-wing monthly publication.

MARKETS—Trends and Prices (*Continued from page* 53)

Copper Production by Countries

Production of copper by countries, so far as available, according to the American Bureau of Metal Statistics, figures in short tons:

	Jan-June 1950	July 1950	Aug. 1950	Sept. 1950	Oct. 1950
United States (a)	452,053	76,563	80,620	80,102	83,689
Canada (refined)	122,834	17,874	19,980	18,932	20,905
Mexico (crude)	31,040	4,297	5,655	5,129	5,627
Chile (b)	(e)171,321	(e)36,300	38,040	28,354	.....
Peru (refined)	11,096	1,710	2,234	1,961	2,018
Federal Rep. of Germany (d)	101,587	19,213	16,939	.....	.....
Japan (refined)	42,815	7,771	7,894	8,412	.....
Australia (crude)	7,746	1,385	1,951	.....	.....
Union of So. Africa (c)	17,828	2,126	.....	.....	.....
Rhodesia (crude)	151,694	27,728	27,739	25,626	25,916
Totals	(e)1,110,014	(e)194,967	.....	.....	.....

(a) Blister or converter copper reported by Copper Institute as "mine production or smelter production or shipments and custom intake." Does not include production from scrap nor from smelting of imported ore except that received from Cuba and the Philippines. (b) Reported as bar copper (includes blister, electrolytic and fire-refined). (c) Blister and fire-refined. (d) Refined copper, both electrolytic and fire-refined, includes scrap. (e) Revised.

Official London Prices

The British Ministry of Supply continues to fix delivered prices of copper, lead and zinc for the United Kingdom. Quotations in effect as December ended were as follows:

	Per Long Ton £	s.	d.
COPPER			
Electrolytic, high conductivity	202	0	0
Fire refined, high conductivity	202	0	0
Fire refined, high grade	201	10	0
Fire refined, min. 99.7 percent	201	0	0
Fire refined, min. 99.2 percent	200	10	0
LEAD:			
Soft, foreign duty paid	136	0	0
Soft, Empire	136	0	0
English, refined	137	10	0
ZINC:			
Foreign (G.o.b.) duty paid	151	0	0
Domestic (G.o.b.) duty paid	151	0	0
Prime Western and debased	151	0	0
Refined and electrolytic	155	0	0
Minimum 99.99 percent	157	0	0

Miscellaneous Metals, Ores, Minerals

Quotations cover wholesale lots, prompt shipment, f.o.b. New York unless otherwise stated

MISCELLANEOUS METALS

December 30, 1950

Aluminum, ingot, 99 plus percent, lb. (base price)	19c.
Antimony, spot, lb., 5 tons and up but less than carload in cases	35.280
Bismuth, ton lots, lb.	$2.25
Cadmium, commercial sticks, delivered, lb.	$2.65
Calcium, 1 lb., ton lots, 98 percent, cast	$2.05
Chromium, 97 percent grade, lb., contract	$1.07
Cobalt, 97 to 99 percent, per lb.	(b)$2.10
Indium, troy oz.	$2.25
Nickel, cathodes, lb., f.o.b. Port Colborne (a)	50½c.
Magnesium, 99.8 percent, carloads, lb., producer's plant, Freeport, Texas	24½c.
Palladium, troy oz.	$24.00
Platinum (Official quotation wholesale lots) troy oz.	$90.00
Quicksilver, flask of 76 lbs., 25 flasks or more	$138@$141
Selenium, 99.5 percent, lb.	$2.00
Silicon, minimum 97 percent, spot, carloads, lb.	16.50c.
Tellurium, lb.	$1.50@$2.00
Thallium, 100 lb. or more, lb.	$12.50
Titanium, 96 to 98 percent, lb.	$5.00

(a) Includes U. S. duty. (b) Effective Jan. 1, 1951.

METALLIC ORES

Beryllium Ore, imported, 10 to 12% BeO, per unit	$28.00
Chrome Ore, per long ton, f.o.b. cars Atl. ports, dry 45% Cr_2O_3, no ratio	$20.00@$25.00
48% Cr_2O_3, 3 to 1 ratio	$36.00@$44.00
Iron Ore, Lake Superior, Lower Lake ports, long ton:	
Old Range bessemer	$8.70
Mesabi bessemer	$8.45
Mesabi, non-bessemer	$8.20
Lead (Galena), 80 percent, Joplin, Mo., ton	$218.42
Manganese Ore—Per long ton unit of Mn basis 48 percent manganese, nearby positions, subject to premiums and penalties, 92 @ 96c., c.i.f. U. S. ports, duty extra. Long-term contract quotations wholly nominal and matter for negotiation.	
Molybdenum Ores, 90%, per lb. of MoS_2 f.o.b. mines	60c.
Tantalite, 60% concentrate, per lb.	$2.00@$2.75
Tungsten Ore, per unit of WO_3	
Foreign, 60 percent, duty paid	$55.00@$56.00
Domestic, scheelite, 60 percent f.o.b. mine	$47.00
Vanadium Ore, per lb. of contained V_2O_5 f.o.b. mines	27½c.
Zinc Ore, Prime, 60 percent concentrate, Joplin, Mo. per ton	$115.00

METALLIC COMPOUNDS

Arsenious Oxide (arsenic trioxide) lb., in bbl. carload lots delivered	6½c.
Cobalt Oxide, 72%, metallurgical grade, per lb. of Co	(b)$2.25
Copper Sulphate, 100 lb.	$8.95

(b) Effective Jan. 1, 1951.

ALLOYS

Beryllium Copper, 4 percent Be, per lb. of alloy, 5 lb. ingot	$1.56
Ferrochrome, 65 to 69 percent, per lb. of Cr contained	21¾c.
Ferromanganese, 78 to 82 percent, gross ton, seaboard	$185.00
Ferromolybdenum, 55 to 65 percent Mo. lb. of Mo. contained	$1.32
Ferrosilicon, 50 percent, per lb. of contained Si	12.4c.
Ferrotungsten, 75 to 80 percent, lb. of W contained	$3.25
Ferrovanadium, per lb. of V delivered	$3.00@$3.25
Silicomanganese, 1½ percent 7, per lb. contracts	9.9c.
Spiegeleisen, per long ton, 19@21%	$75.00

NON-METALLIC MINERALS

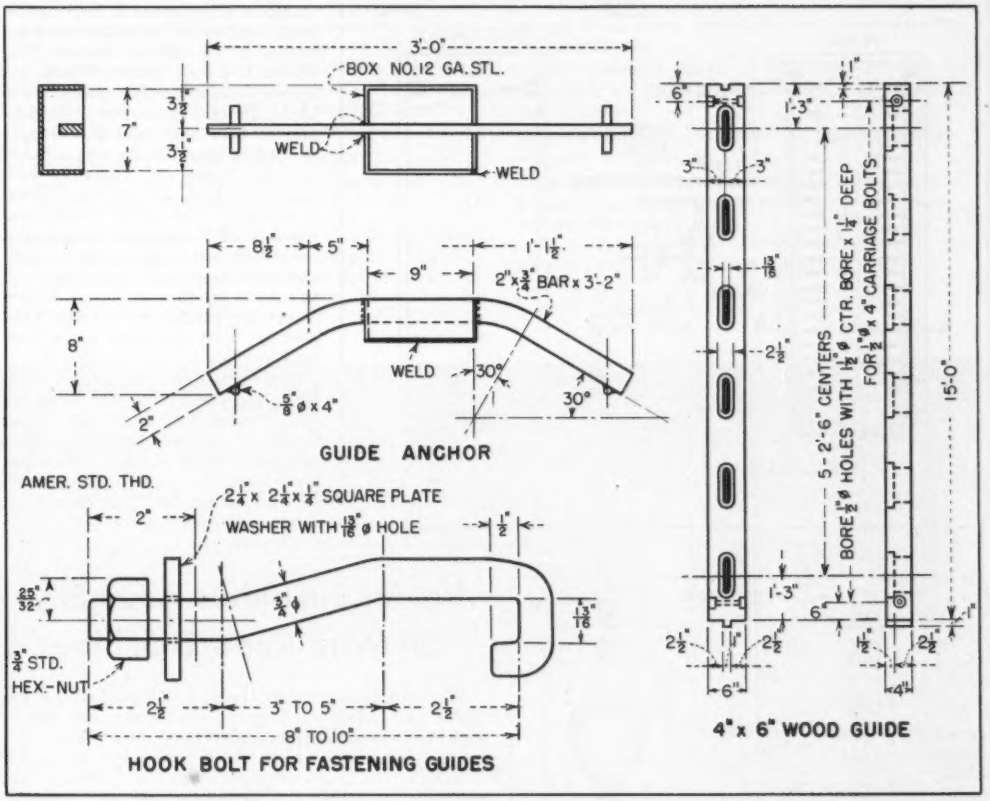
Asbestos, f.o.b. Canada (Quebec) mines (U. S. funds), ton:	
Crude No. 1	$960@$1,050
Crude No. 2	$492@$550
Spinning fibers	$232@$475
Shingle fibers	$95.50@$141
Paper stock	$78.50@$88
Waste	$58
Shorts	$27@$52
Asbestos, Vermont, f.o.b. Hyde Park:	
Shingle stock	$97.00@$107.00
Paper stock	$68.50@$85.00
Waste	$51.00
Refuse or shorts	$25.50@$46.50
Barytes, f.o.b. mines:	
Georgia, crude, per long ton	$13.00@$13.50
Missouri, 93 to 94 percent $BaSO_4$, per short ton	$9.25@$9.50
Bauxite, long ton, f.o.b. point of shipment:	
Domestic, crude, 50 to 52 percent (not dried)	(a)$4.50@$5.50
Domestic, chemical, 55 to 58 percent	(a)$8.50@$9.50
Domestic, abrasive, 80 to 84 percent	$18.00@$18.50
China Clay, f.o.b. mines, ton:	
Georgia, filler and ceramic grades	$8.50@$9.50
North Carolina ceramic grade	$20.25@$22.25
Feldspar, bulk ton:	
Potash or soda fedspar, 200 mesh, ceramic grade	$18.50@$22.25
Glass par, white, 20 mesh	$11.75@$12.50
Fluospar, f.o.b. mines, bulk, Kentucky and Illinois, 70% effective, CaF_2, ton	$41.00
Acid 97% concentrate, bulk, ton	$46.50
Fuller's earth, f.o.b. Georgia or Florida, ton	$7.00@$14.00
Magnesite, per ton dead-burned, bulk, f.o.b. Washington	$36.30
Mica—Domestic, f.o.b. mines. Punch, 12 to 22c. per lb. according to size and quality. Sheet, clear, 1½ x 2 inch, 70 to 75c.; 2 x 2 inch, $1.10 to $1.20; 2 x 3 inch, $1.40@$1.50; 3 x 3 inch, $1.70@$1.80; 3 x 4 inch, $2.10; 3 x 5 inch, $2.40; 4 x 6 inch, $3.15; 6 x 8 inch, $4.25. Wet ground, very fine, $120@$130 per ton. Bulk sales, dry ground, $32.50@$60.00 per ton. Scrap, $30 and up.	
Ocher, Georgia, ton, in sacks	$24.00
Pyrites, Spanish, per long ton unit of S, c.i.f. Atlantic ports	(a)12@14c.
Sulphur, Texas, mines, long ton	$22.00
Talc, f.o.b. works, ton:	
New York, purified	$18.50@$20.00
Vermont, extra white	$12.50
Tripoli, Missouri, ton:	
40 mesh, cream colored	$30.00

(a) Nominal.

IRON AND STEEL

Pig iron, gross ton, basic, Valley furnaces	$52.00
Steel, f.o.b., Pittsburgh billets, net ton	$56.00
Structural shapes, 100 lb.	$3.65

OPERATING IDEAS



Shaft Guide Anchors Permit Easy Alignment

A new type of guide anchor for concrete-lined shafts has been devised for the Kelley Shaft of the Anaconda Copper Mining Co. at Butte, Mont. The anchor, shown here, is cast into place in the concrete side and end walls. It consists of a pre-fabricated open-faced box for blocking out the concrete from around the exposed center portion of a 2x¾-in. steel bar horizontally mounted and anchored securely in the concrete. The anchor is fastened to the outside of the steel shaft form during the pouring operation by means of a single hook-bolt, removal of which allows the anchor to remain in place while the form is being lifted.

The guides are wooden and are made with counterbored and slotted holes as shown. The guide shown here is a temporary guide. Permanent guides will be 5x10-in. in cross section.

The guides are fastened to the anchors with hook-bolts, also shown. Slots in the guides allow for vertical adjustment, and movement of the hook-bolts along the horizontal steel bar anchors permits lateral adjustment. A slight serration in the grips of the hook-bolts prevents movement due to lateral pounding of the shaft equipment.

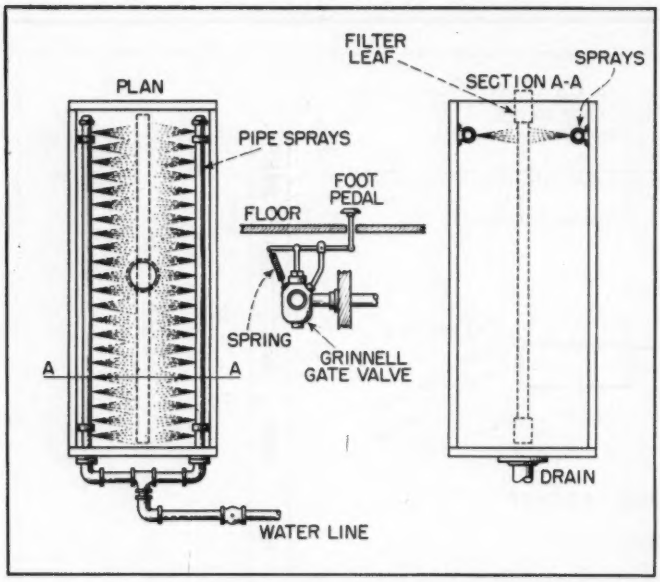
Anchors for fastening guides to shaft centers consists of similar pieces of 2x¾-in. flat bars held horizontally between two pieces of steel angle, and secured to the tops of the centers by means of through-bolts. The same guide and hook-bolts are used on these anchors. Guide anchors are placed at 2½-ft. intervals. All or alternate fastenings may be used as required.

Anchors for temporary sinking guides located on the wall plate sides of both end compartments and in opposing positions may serve as sockets for extensible steel beams which may be inserted and fastened in position for the support of staging if needed in the future.

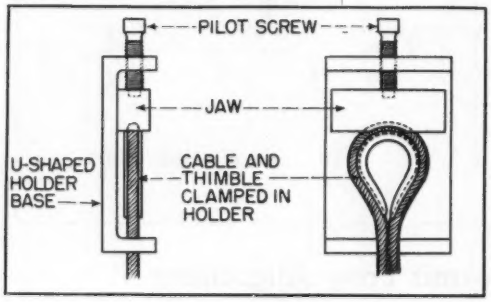
This type of guide fastening will permit ample adjustment vertically and horizontally for any conceivable re-alignment of guides and will facilitate their removal.

E&MJ expresses its thanks to R. J. Kennard, chief engineer of Anaconda, for sending this description; to Mr. McKenna, mechanical engineer, for preparing the drawings; and to E. S. McGlone, for releasing this information.

Sprays Clean Filter Leaves Faster



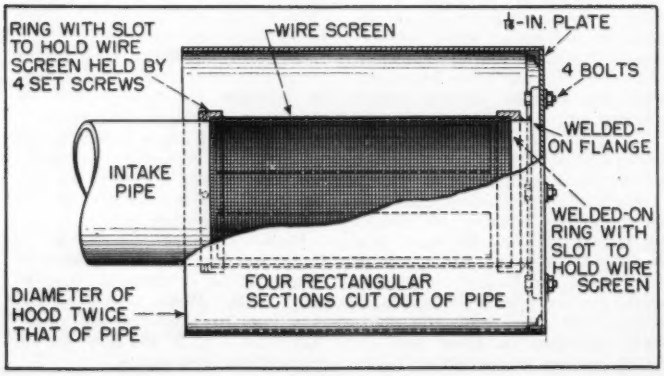
Prior to the installation of the spray tank shown, cleaning of 5x8-ft. Moore filter leaves in the cyanide plant section of the 2,250-ton concentrator of Howe Sound Co., Chelan Division, Holden, Wash., by conventional methods required from 15 to 20 min. with two men employed. The same task is now performed in less than 25 sec., according to Victor A. Zandon, mill superintendent, and no hand work is involved. The spray installation consists of a wooden rectangular tank with two built-in pipe sprays, and a Grinnell gate valve assembly to control the flow of water. Filter leaves are handled by a small Yale electric hoist installed above the tank capable of lifting 1,000 lb. at a maximum speed of 17 fpm. The leaf suspended from the hoist is first lowered into the tank. Then the gate valve is opened by means of a pedal above the floor which the operator keeps depressed until the entire leaf has been raised out of the spray zone of the tank.



Holder Simplifies Assembly Of Wire-Rope Thimbles

Mine mechanics will be able to fit thimbles in steel cables and splice wire-rope slings faster and easier with the help of a holder shown here. The holder consists of a U-shaped base, clamp, and pilot screw, all of which are made of mild steel. To operate, the mechanic must hold the cable thimble firmly in place while the clamps are being fastened. Thereafter the holder can be clamped in a vise and the mechanic will be free to use both hands to complete the splice.

Intake Screen for Air Compressors


RING WITH SLOT TO HOLD WIRE SCREEN HELD BY 4 SET SCREWS
WIRE SCREEN
¼-IN. PLATE
4 BOLTS
WELDED-ON FLANGE
INTAKE PIPE
WELDED-ON RING WITH SLOT TO HOLD WIRE SCREEN
DIAMETER OF HOOD TWICE THAT OF PIPE
FOUR RECTANGULAR SECTIONS CUT OUT OF PIPE

The type of intake screen shown here has given satisfactory service at the compressor plant of a gold-silver mine in central Mexico. The four sections in the compressor intake pipe are cut out with a torch. The hood, attached by four bolts to the flange or disk welded onto the end of the intake pipe, is made from 1/16-in. sheet iron. The diameter of the hood is twice that of the intake pipe. Fine wire screen covers the four pipe openings. It is held in place by two mild-steel rings, one welded in place near the flanged top of the intake pipe and the other attached by setscrews to facilitate removal of the screen for cleaning.

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Keep your mine haulage equipment moving at top speed, all day long, with Exide-Ironclad Batteries. They respond instantly and fully to all power demands—continuous or intermittent. And their large reserve power is ample for emergency needs. Exide-Ironclad Batteries also assure you:

ROUND-THE-CLOCK-PERFORMANCE—no unscheduled down time, no mechanical trouble, no slow-downs toward end of shift.

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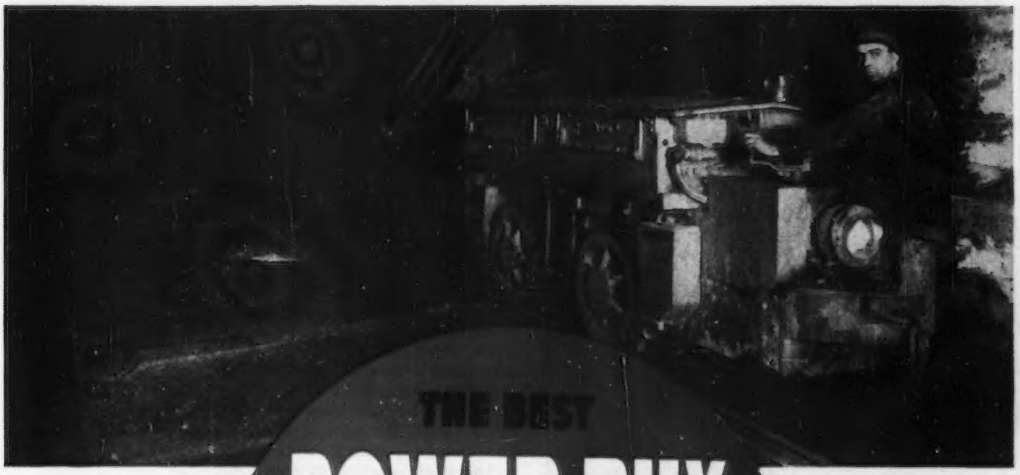
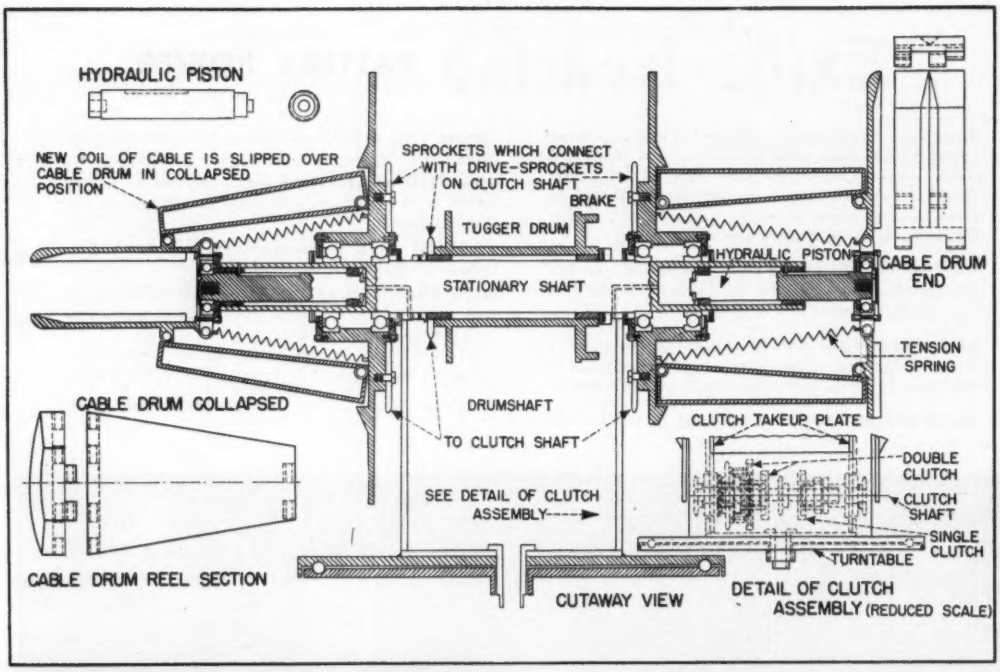
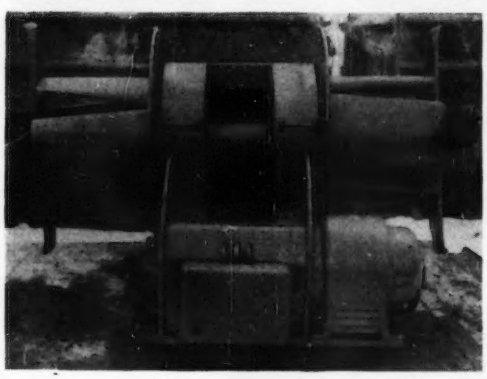
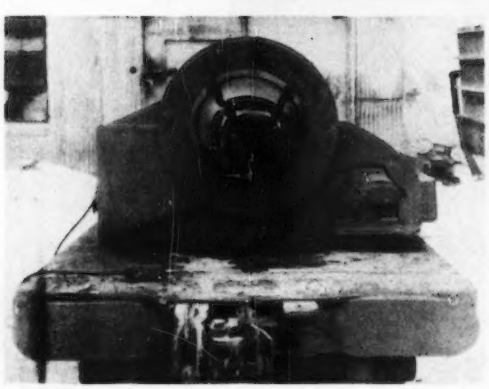


1888...DEPENDABLE BATTERIES FOR 63 YEARS...1951







Car Simplifies Cable Change

Changing slusher cables at the Climax Molybdenum Co. operations, Climax, Colo., has been greatly simplified since the operating staff designed the cable car shown here. This is an important item at Climax because there are about 45 slushers in operation, and each slusher uses 200 to 400 ft. of $1\frac{1}{8}$ or $1\frac{1}{4}$-in. cable. Formerly changing cables required the help of 5 to 6 men, who worked about 30 to 60 min. to change a cable. With the help of this new unit, two men can now change a cable in 15 to 20 min.

The unit consists of two "outboard" cable drums with collapsible sides which reel in the old cable or reel out the replacement cable. The center tugger drum carries 600 ft. of $\frac{3}{8}$-in. cable which is used to pull the larger slusher cables through sheaves and to the hoist drums, or to pull worn cables back to the cable car.

A system of multiple clutches permits the two reels and drum to be rotated together or independently in either direction. Power is supplied by a 5-hp. a.c. motor with reduction unit which operates on 440-v. current.

Removal of old cables from the reels or placing new cables on the reels is greatly simplified by the collapsible drum feature shown. Hydraulic cylinders actuated by small hand pumps enable the operators to collapse segments of the cable-drum side as shown. This operation takes only a minute. Segments are restored to their normal position with the help of tension springs.

The entire unit is mounted on a flat car and can be rotated at will. Clutches which regulate rotation of the reels and drum are operated by remote control. Cecil Smith, master mechanic, and Richard Wilson, assistant master mechanic, designed the unit.

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Convenient to mining, milling and smelting operations from coast to coast, thirteen Ryerson steel-service plants stand ready to supply the mining industry and its equipment manufacturers.

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From switchboard to shipping floor all of us are ready to give you prompt service whenever humanly possible. So call us when you need steel.

PRINCIPAL PRODUCTS

CARBON STEEL BARS—Hot rolled and cold finished
STRUCTURALS — Channels, angles, beams, etc.
PLATES—Many types including Inland 4-Way Safety Plate
SHEETS—Hot and cold rolled, many types and coatings
TUBING—Seamless and welded, mechanical and boiler tubes
ALLOYS—Hot rolled, cold finished, heat treated
STAINLESS — Allegheny bars, plates, sheets, tubes, etc.
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PERSONAL NEWS

NEWLY ELECTED VICE PRESIDENTS of Freeport Sulphur Co. are (left to right) Robert C. Hills, who joined the company in 1934 as a chemist at the sulphur operations in Louisiana and was made assistant to the president in 1946; Thomas K. Vaughan, assistant vice president, who joined Freeport in 1942 and became assistant secretary later that year; and Richard C. Wells, formerly assistant treasurer, and controller since 1946.

Donald MacAskill is now in the Fluo-Solids Division of the Dorr Co. at Westport, Conn.

Edwin M. Haun, of St. Louis, has been made a member of the development department of Monsanto Chemical Co.'s Phosphate Division, according to **A. T. Beauregard**, director of the department.

P. H. Reagan, consulting mining engineer, of Hye, Tex., returned to the United States in December from Australia where he has been engaged in professional work. He will visit Latin America before returning to Australia in March.

H. A. Salinger and **Charles L. Allen** have been appointed directors of Idaho Maryland Mines Corp., to replace **Neil O'Donnell** and **J. D. Hoffman**, who resigned recently. Mr. Allen is now general manager.

J. G. Donaldson, formerly with the Battelle Memorial Institute in Columbus, Ohio, is now with the U. S. Bureau of Mines in Rollo, Mo.

Donald G. Dahle has joined the Calera Mining Co., a subsidiary of Howe Sound Co.

K. M. Dewar is now an underground superintendent at the iron mines of Steep Rock Lake Mines in Ontario.

Roland D. Parks, of Massachusetts Institute of Technology, has been appointed an associate with Behre Dolbear & Co. **F. Blondel** of Paris and **Dr. Tadishiro Inouye** of Tokyo have been named foreign consultants.

Frederick A. Hauck, president of Continental Mineral Processing Corp., recently announced the removal of their offices from 1413 Traction Bldg. to 609-610 First National Bank Bldg., Cincinnati, Ohio.

William J. Pearce, field engineer for Stone & Webster Engineering Corp., has been transferred from the Niagara Mohawk's Power Corp. steam station at Dunkirk to a similar steam station under construction at Albany, N. Y.

J. T. Shimmin, Jr., formerly assistant chemist for Utah Copper Division of Kennecott Copper Corp., has accepted a position as junior engineer in the metallurgical offices of the Ray Mines Division of Kennecott.

Dr. John S. Stevenson, of the engineering department of the British Columbia Department of Mines, has resigned his post to become associate professor of mineralogy of the department of geology at McGill University in Montreal.

J. R. Hanlon, superintendent of the Surf Inlet mine on Princess Royal Island from 1922 to 1926 and later consultant for Hollinger Consolidated Gold Mines and other eastern Canadian mining firms, has been appointed mine superintendent of Hamil Silver Lead Mines, Ltd., Ainsworth, B. C.

Karl H. Koropp has been named assistant superintendent of Kennecott Copper Corp.'s new electrolytic refinery at Garfield, Utah. Until recently he was in charge of the Cerro de Pasco Copper Corp. refinery in Peru.

Kenelm Winslow, mining engineer, formerly with M. A. Hanna Co. at Degrasse, N. Y., is now with the Warren Foundry & Pipe Co.'s Mount Hope iron mine at Dover, N. J.

J. F. Wolff, Sr., general mining engineer for Oliver Iron Mining Co., retired Dec. 1. He is the last of a group of engineers who were associated with the original officers of the Oliver company when Thomas F. Cole was its first president. He investigated iron ore properties in South America and is recognized for his outstanding work in determining from mine workings and drill samples the detailed structure of the Mesabi, Cuyuna and Gogebic ranges. **Lloyd J. Severson** has been appointed to succeed Mr. Wolff.

William M. Bowlus, engineer for M. A. Hanna Co. at the Bengal, Tully and Wauseca mines, has accepted a position as assistant professor of mining engineering at Michigan College of Mining & Technology.

W. R. Green, mining engineer of Spokane, has been elected president of Mines Management, Inc., to succeed the late C. O. Dunlop.

K. C. Brownell, president, and **J. D. MacKenzie**, vice president of American Smelting & Refining Co., visited the company's lead smelter at Alton, Ill., during the fall. **R. D. Bradford**, formerly general manager of the Salt Lake department, and recently appointed general manager of the Western Department of the company, paid an extended visit to the New York office during November.

Kuno Doerr, Jr., manager of the East Helena smelter, AS&R, recently visited the company's general offices

Mining Geologists Needed

The U. S. Geological Survey's new responsibilities under the Defense Production Act of 1950 will require the addition of mining geologists for field and office work on metallic and nonmetallic mineral deposits. Field work will consist of making mine examinations and appraisals in connection with applications for loans, purchase contracts, and other encouragement under the Act. Office work will be done in Washington, D. C., and will consist largely of reviewing and analyzing field appraisals and other data, and making recommendations in cooperation with the Bureau of Mines, Defense Minerals Administration, and other agencies for expansion of mineral production.

Openings are available at grades of GS-9 ($4,600 per year) to GS-13 ($7,600 per year). A minimum of 5 years post-bachelor experience, preferably in mining geology, is required for these positions. For further information write to the Chief, Mineral Deposits Branch, U. S. Geological Survey, Washington 25, D. C.

a new and proven tool in metallic and non-metallic minerals and chemical processing

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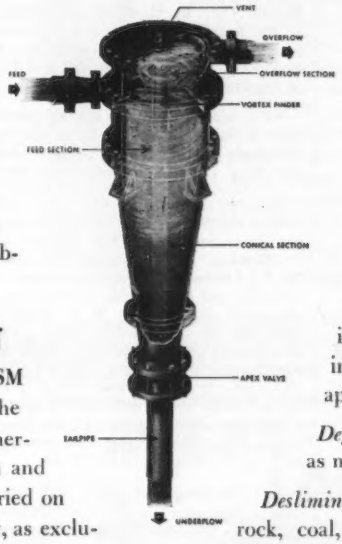
(DUTCH STATE MINES CYCLONE)

The DorrClone is a compact cylindro-conical classification unit utilizing centrifugal force in place of gravity. It provides a new method of separating finely divided solids in liquid suspensions and constitutes an important new tool with which to supplement current established practices.



RESEARCH AND DEVELOPMENT

Development of the DorrClone (DSM Cyclone) was begun in 1939 by the Dutch State Mines in The Netherlands, where a continuing research and development program has been carried on since that time. The Dorr Company, as exclusive licensee under the Dutch State Mines patent rights in all fields other than that of heavy media separation, has been actively engaged since 1948 in development work relating to design variables affecting performance, materials of construction and possible fields of commercial use. The result of this program is a carefully engineered unit, capable of controlled and predictable operation.

PRESENT AVAILABILITY

DorrClones are now available singly or in multiple arrangements in four standard sizes: 3″, 6″, 12″ and 24″ diameters.

APPLICATIONS

Standard units are now limited to separations in the 20 micron to 100 mesh range but present studies indicate broader applications in the future. Typical commercial applications proven to date are:

Degritting of viscous suspensions such as milk of lime and clay slurries.

Desliming of metallurgical pulps, phosphate rock, coal, iron ore and tailings for mine backfill, with the production of extremely dense underflows where such are desired.

Classification of crystalline and other granular suspensions.

PATENTS

The DorrClone is covered by patents issued and pending in the United States and other countries.

Further information... We welcome inquiries on specific problems and applications and are prepared to undertake engineering investigations within the scope of our present knowledge and experience.

*DorrClone is a Trademark of The Dorr Company

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Flexible ALL METAL
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FOR POWER TRANSMISSION
REQUIRE NO MAINTENANCE

Patented Flexible Disc Rings of special steel transmit the power and provide for misalignment and end float.

Thomas Couplings have a wide range of speeds, horsepower and shaft sizes:
½ to 40,000 HP
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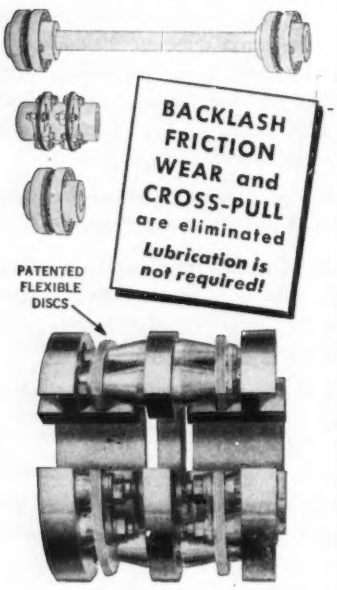

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WARREN, PENNSYLVANIA

in New York. **R. F. Goodwin**, vice president, has returned from a trip to England on company business. **C. P. Pollock**, resident engineer, has returned from a trip to the Coeur d' Alenes. **H. A. Kursell**, consulting engineer, has made an extended visit to the company's properties in Peru.

Rowland King, former president of Northwest Mining Association and chairman of the nominating committee, has announced the following nominations for 3-year terms starting Jan. 1 to the Association's board of trustees: **J. W. Melrose**, Spokane consulting geologist; **J. C. Kieffer**, Kellogg manager of the Spokane-Idaho Mining Co.; **E. R. Marble**, manager of the American Smelting & Refining Co.'s Tacoma smelter, and **R. J. Towne**, of the Towne Equipment Co. of Spokane.

Al. C. Fisher has been elected president of South Butte Mining & Milling Co., **Rudy E. Endresse**, vice president, and **Earl Lynch**, secretary-treasurer.

Among those who have recently visited the New York office of American Smelting & Refining Co. are: **E. P. Fleming**, consulting metallurgist; **A. L. Labbe**, supervising engineer, cottrells and baghouses, western metallurgical department; **E. R. Marble**, manager of the Tacoma plant, and his assistant, **G. E. Sigler**; **R. C. Beckstead**, director of safety and technical employment; **L. V. Olson**, director of agricultural research. Mr. Fleming and Mr. Olson also attended the meeting of Industrial Hygiene Foundation held in Pittsburgh, Nov. 15-16.

A. G. Dickinson of Trail, B.C., electrical engineer with Consolidated Mining & Smelting Company of Canada, has been named a member of the council of the Association of Professional Engineers of British Columbia.

Robert Gregg retired Jan. 1 as president of Tennessee Coal, Iron & Railroad Co., U. S. Steel Corporation subsidiary, Birmingham, Ala., and was succeeded by **Arthur V. Wiebel** who has been vice president in charge of operations. (This news has been received just as these pages are going to press.)

William H. Brady has retired as treasurer of The American Metal Co., Ltd., after 56 years of active service. He will be succeeded by **Hans A. Vogelstein**, secretary, and will continue as consultant to the company. **Thomas W. Childs** has been named secretary. **Hugo de Neufville** has been appointed director of smelting and refining operations, **Ernest T. Rose**, director of raw material supply, and **Jean Vuillequez**, director of sales.

E. C. Stephens, geologist for Anaconda Copper Mining Co., has been elected president of the Northwest Mining Association. He succeeds **H. J. Hull**, of Wallace, Idaho. **David E. Watson**, secretary of the Thomas Mines, is first vice president; **Wallace G. Woolf**, general manager of the Sullivan zinc plant at Kellogg, second vice president; **E. K. Barnes**, treasurer, and **Roger O. Oscarson**, mining engineer, secretary.

Alden P. Colvocoresses, ventilation engineer at the Magma Copper Co., Superior, Ariz., has been called to active duty with the Corps of Engineers. He will be stationed in Washington, D. C., with the Intelligence Section of the Army Map Service. The files of his late father, **George M. Colvocoresses**, which include data on over 1,000 different properties in Arizona and adjoining states have been turned over to the Allison Steel Co., of Phoenix, Ariz., where they will be available to the mining industry.

Robert G. Kenly has been appointed general sales manager of The New Jersey Zinc Co. and The New Jersey Zinc Sales Co. He succeeds **Ralph M. Neumann**, who retired on Dec. 31 after 44 years of service with the company.

Willis M. Peirce, assistant to the general manager of the technical department of The New Jersey Zinc Co., Palmerton, Pa., has been elected president of the American Institute of Mining & Metallurgical Engineers for 1951. He will take office on Feb. 20 at the annual meeting in St. Louis. **Joseph L. Gillson**, geologist with E. I. du Pont de Nemours & Co., and **Michael L. Haider**, vice president and general manager, production department, Imperial Oil Ltd., have been elected vice presidents and directors for three years. The following additional new directors have been elected: **Thomas G. Moore**, manager, mining department, American Metal Co., Ltd.; **Charles E. Lawall, C&O Railway**; **John F. Myers**, Tennessee Copper Co.; **Fay W. Libbey**, director, Oregon State Dept. of Geology & Mineral Industries; **Albert C. Rubel**, Union Oil Co. of California; and **Leo F. Reinartz**, Armco Steel Corp. Division chairmen were announced as follows: Mineral Economics—**Richard J. Lund**, Battelle Memorial Institute; Mineral Industry Education—**Allison Butts**, Lehigh University; Industrial Minerals—**A. B. Cummins**, Johns-Manville Co., Manville, N. J.; Institute of Metals—**R. M. Brick**, University of Pennsylvania; Coal—**Carroll A. Garner**, Jeddo-Highland Coal Co.; Minerals Beneficiation—**Raymond E. Byler**, Merrill Co., San Francisco; Extractive Metallurgy—**Oliver C. Ralston**, U. S. Bureau of Mines; Petroleum — **Richard W. French**, Sohio Petroleum Co.; Iron and Steel—**T. L. Joseph**, Minnesota School of Mines & Metallurgy; Mining, Geology and Geophysics—chairman to be elected at the annual meeting.

Frank N. Spencer, Jr., has resigned as chief mining engineer and geologist for Cia. Minera Aguilar in Argentina

In order to take the post of resident mining engineer in New York for Cerro de Pasco Copper Corp. He began his new duties Dec. 18.

OBITUARIES

Charles Engelhard, president of Baker & Co., died Dec. 1 at his home in Bernardsville, N. J. He was 83. Dr. Engelhard, who was an honorary life member of the board of trustees of Stevens Institute of Technology, was widely known in the precious metals industry.

George Frederick Schultz, 71, president and general manager of Call Industries of Idaho and a director of the Bullion Monarch Mining Co., died in Salt Lake City Nov. 16. He had been active in the past few years in the development of uranium mining operations at Marysvale, Utah, where he was one of the organizers of Bullion Monarch.

Prof. J. O. Howell, mining engineer for Osoyoos Gold Mines in British Columbia, died Nov. 11 at Osoyoos, following a fall from a horse. He was known in Canada and England as a mining expert and at one time was head of the geology department at the Institute of Technology and Art at Calgary, Alberta. He was 53.

Martin P. Vonich, 80, Calaveras County mining man, died Nov. 29 in Oakland, Calif.

Hartwig A. Cohen, mining engineer, died recently in San Francisco. He had been manager for the Captain Delamar properties in Mercur, Utah.

Vern A. Hart, 76, former manager of the Walker mine in Plumas County, died Nov. 1. He was active in mining for many years in the western states and in Mexico.

A. H. Woodward, chairman of the board of directors of Woodward Iron Co., Birmingham, Ala., died Nov. 23. He was also vice chairman of the board of Wheeling Steel Corp.

C. Quinby Schlereth, consulting engineer, died suddenly Nov. 11 in Denver. He was well known in the industry. Mr. Schlereth was a graduate of the Colorado School of Mines.

Maj. Richard S. Eskridge, 78, mining engineer and geologist, died Dec. 4 at Olympia, Wash.

Correction:

Referring to our description of the Vulcan operations in the Idaho news (Dec., p. 132), this property was erroneously reported as owned by Callahan Zinc-Lead Mining Co. Actually, the Vulcan Co. is a subsidiary of the Callahan company and owned 62% by it.

GET SURE, SAFE Braking with the

MESCO Hydraulic Brake Adjustor

Sudden release of braking power on mine locomotives can cause disastrous accidents. The MESCO Hydraulic Brake Adjustor prevents these accidents because it has no threaded parts to rust, strip, or wear. Brake adjustments are quickly and positively made anywhere at any time . . . wherever a grease gun is available. Any quality grease can be used.

The MESCO Hydraulic Brake Adjustor is easy to install and is adaptable to most mine locomotives. It is available in any length from 10" rod centers up and can be furnished with tubular grease extension for closed type frames. Play it safe . . . investigate the MESCO Hydraulic Brake Adjustor today.

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"A COMPLETE LINE OF RAIL BONDS AND OTHER TRACK AND TROLLEY PRODUCTS FOR THE MINING INDUSTRY"

ATLAS LOCOMOTIVES

Type J 1½ Ton Trammer

LOWER OPERATING COSTS—
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Battery Operated
"Dead Man" control
Gasketed compartments
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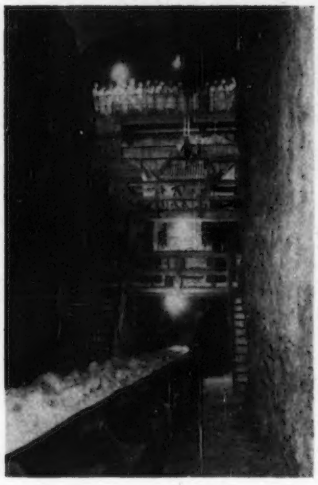
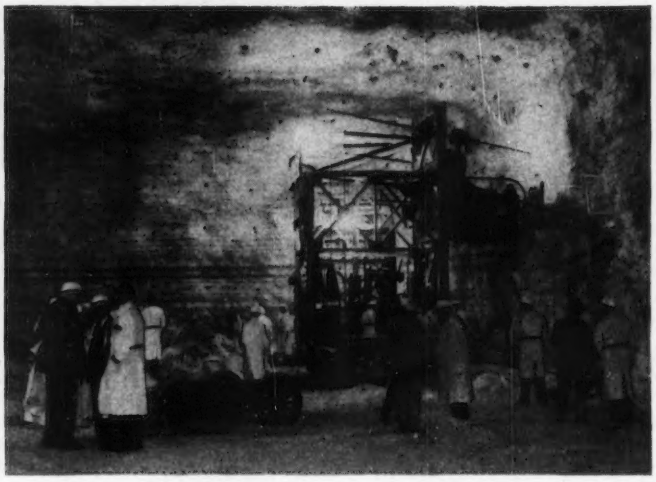
Complete details and specifications on request.

THE ATLAS CAR & MFG. CO.
CLEVELAND



CONVEYOR carries rock from underground crusher to grading machines.



MODERN MACHINERY and up-to-date quarry methods are employed wherever possible in the mine and have accounted for low mining costs.

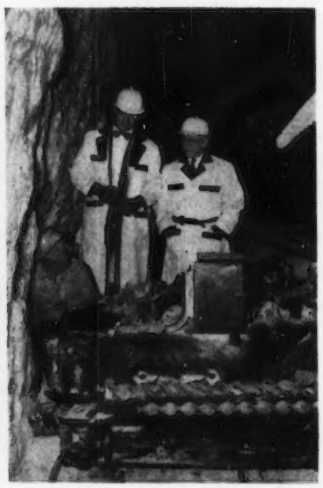
Detroit Underground

FAR BELOW the surface hustle and bustle of Detroit, Michigan, lies a silent, white, gleaming city. It has 60 miles of smooth streets and alleys complete with traffic lights, stop signs and car tracks. This is the Detroit mine of the International Salt Co.

Mining operations were begun 44 years ago. Today it is one of the most modern mines in the world. The headframe is located near Fort and Sanders in Southwest Detroit, and the extensive workings now extend from Port Huron to Trenton. The mine produces 4,000 tons of salt a day and sorts it into 4 grades.

All photos from Wide World.

MAIN TUNNEL is more than 1,100 ft. from the surface. It's 22 ft. high and in some places, 60 ft. wide.



GOV. WILLIAMS of Michigan (l.) and Mayor Cobo of Detroit on tour.

IN MINING

IN THE UNITED STATES

- 5-Year Government Contract for Climax—p. 104
- Garfield Cobalt Refinery Under Construction—p. 119
- Labor Dispute Settled at Tacoma—p. 121

ALASKA

★**Placer operations are planned again for 1951** on Lost River in the Kotsebue area by U. S. Tin Co. which has taken out approximately 100 tons of cassiterite since July, 1950. Some wolframite is found in the ore, which is about 78% tin.

★Al Stout will use the **slick plate method of placer mining** on Ballarat Creek in 1951 when he operates for the Yukon Placers. He had taken two bulldozers to the property in the fall and expected to bring in a third before the end of the year.

★Operations at the **Utopia Creek property** were closed down in October by William Strandberg. The Candle Creek dredge of the Strandberg brothers was to continue work later in the fall.

★J. E. Railey Investment Co., which did exploratory work on Otter Creek in 1950, **plans to use a 3½-cu. ft. dredge** during the 1951 season.

★Havenstrite Mining Co.'s **gold placer operations** at Candle, Mud Creek and Jump Creek had a successful season, according to Jack Allen, Manager. Seven bulldozers, three draglines and one of two dredges were operated by about 100 employees. Operating plans are similar for 1951.

★**Alluvial Gold Coal Creek dredge** which employed 15 during the 1950 season closed down early in November.

CALIFORNIA

★**Placer gold production is on the increase** in the Nevada City area, with companies successfully working the Snow Point, You Bet and other gravel channels.

The Rich-Kiss Mining Co. has a plant in operation at the You Bet channel. Also in the You Bet region is the gravel-washing operation of Dacher & Savage of San Francisco.

At Snow Point the Howie Mining Co. is working a virgin section of the channel through 400 ft. of drift extended from the 230-ft. vertical shaft, handling about 100 cu. yd. of gravel daily. The company owns about 900 acres covering an untouched part of the channel.

★In Mariposa County, 20 lode and seven placer properties are active, with **highest production centered in the Coulterville and Hornitos areas.** The Marble Spring mine in the Coulterville region has steady production from a vein 1 to 2 ft. wide on the 400-ft level. An 8-ft. ledge is reported exposed by an 80-ft. winze about 500 ft. north of the 400-ft. level workings. And in the Sweetwater district, R. H. Jackson is planning to install a concentrating unit at his Early Gold property mill.

★About 45 small properties are busy in Inyo County. **Recently reactivated by the Corona Mining Co. of Trona is the Corona mine,** formerly known as the Gem and Benton District, last worked in 1940, has also been reactivated.

★**The Paragon hydraulic mine** in the Auburn area has been yielding gravel carrying profitable gold. Material is sluiced through the bedrock tunnel and debris stored behind the North Fork Dam.

★The California Liberty Mine Co. **is making progress with the sinking of a 300-ft. shaft** at its gold property near Marysville. A crosscut from the 300-ft. level is planned to contact the main orebody.

★Another successfully rehabilitated mine in the **Providence property near Tuolumne.** A $500,000 investment in the form of new mining machinery and a mill by Providence-Tuolumne Gold mines has made the mine once again a leading producer on the Mother Lode. Though formerly worked to a depth of 1,470 ft., mining is at present on and above the 600-ft. level only. A new tunnel extended from the 600-ft. level drains the property to that depth, eliminating pumping. An electric train hauls ore through the tunnel to the mill, equipped with a primary crusher, ball mill, flotation cells and gold-saving units. Thirty men are employed at the operation.

★Gold production on a substantial scale is planned by the Wiser-Hughes Development Co. at the **Lucky S lode gold mine** near Taylorsville, where a crosscut tunnel driven about 560 ft. is reported to have intersected the downward extension of the main ledge.

★**The Sarita Milling Co.** is increasing the capacity of its mill and power plant at its Masonic district properties, 9 mi. east of Bridgeport. Under the new expansion, the company is reported to be milling 100 tons of gold ore daily, mined from the Chemung, Pittsburg-Liberty, Sarita, and other properties. The company is also working a gold-silver bearing formation in the Masonic district, with wide ore-bearing dikes and scattered amounts of rich ore.

★The Natomas Co., a gold dredging firm, and its subsidiary, Natomas Water Co., **reported a decrease in net income** for the September quarter compared with the same period for 1949. This year's figure, before income tax, is $223,790, while last year's was $243,203. Profit for the nine-month period ended Sept. 30 was $398,707, before tax, compared with $557,470 in the corresponding 1949 period.

COLORADO

★**At Cripple Creek an order has been placed for three 15-ton GMC ore dump trucks,** according to Merrill Shoup, president of the Golden Cycle Corp. These are the first in a fleet of 13 which the company intends to purchase for the purpose of hauling ore from the mines of the district to the new Carlton mill.

★**Rocky Mountain Diamond Drilling Co., operating in Mineral Park, Alma, is making regular shipments of high-grade lead-zinc ore to the A.S.&R. Co.** and the Resurrection mill at Leadville. Last shipments are estimated

here's your new Clevis Hook Team

A LAUGHLIN EXCLUSIVE THAT PAYS OFF DOUBLE!

A success from the very start, the Laughlin Clevis Grab Hook has proved so popular that users in many fields have asked us: "Why not a slip hook with the same clevis advantages?" We agreed and it's available for the first time.

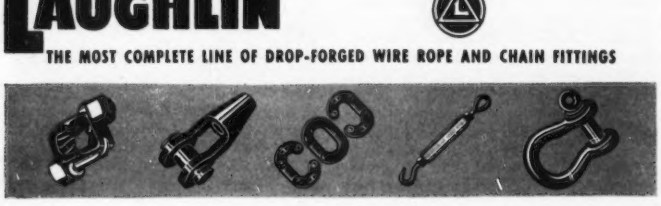
Like the Grab Hook, the new Slip Hook is easily attached to any welded chain — no connecting fitting needed, and no cutting, bending or rewelding. *You just slip the pin through the clevis and chain, spread the cotter—and that's all!*

Rugged, heat-treated and drop-forged. Stronger than ordinary hooks — and safer. Forged cotter-housings protect workers' hands.

Separately, these exclusive Laughlin fittings are tops in their own particular jobs. Together, they form a team that can't be equalled for cost-cutting efficiency. Put them to work for you, saving time, labor and money! . . . Write for Laughlin's Catalog 145, data book of the industry. THE THOMAS LAUGHLIN COMPANY, DEPT. 5, PORTLAND 6, MAINE.

LAUGHLIN

THE MOST COMPLETE LINE OF DROP-FORGED WIRE ROPE AND CHAIN FITTINGS



Colorado (*Continued*)

to be carrying over 20% lead; 20% zinc and a considerable amount of silver. The property is being operated under a lease from the Alma Syndicate.

★**Samples of native copper** ore taken from the 400-ft. level of the Cashin mine in Montrose County, operated by the Paradox Corp., are creating interest. The management expects to produce a rough concentrate that will run 15%.

★Cripple Creek men have incorporated **Canyon Gold, Inc.,** to operate a five-year lease on the Grace Greenwood tract on Gold Hill, a property of the Golden Cycle Corp.

★**The U. S. Atomic Energy Commission has issued invitations for bids** for furnishing all specified labor, materials, and services for performing a minimum of 60,000 ft. and a maximum of 110,000 ft. of diamond drilling. It is expected that drilling will be initiated in early February, 1951. The drilling will be performed in the Blanding uranium district 11 miles southwest of Blanding, Utah.

★**The new Carlton** mill of the Golden Cycle Corp. at Cripple Creek was given a trial run on Thanksgiving Day. The big crusher was started and the rock went on its journey through the mill to test conveyor belts, screens and sampling equipment. The test was pronounced satisfactory. According to present indications, the Cripple Creek district will be humming with activity in 1951.

★Climax Molybdenum Co. announced that it had entered into a contract with the Government which requires it to operate its property at Climax at a maximum capacity for a period of five years.

IDAHO

★**Lucky Friday Silver-Lead Mining Co.** at Mullan has shipped 7,500 tons of stockpiled silver-lead ore to the Golconda custom mill and produced 11 carloads of lead concentrates and two cars of zinc concentrates. The company's orebody on the 1,800-ft. level has been drifted on for a distance of 190 ft. and shows a width of high-grade ore averaging from 7 to 8 ft. wide. The company is continuing its crosscut on the 1,800-ft. level toward another vein developed on the 1,600-ft. level. About 25 men are employed.

★**Mascot Mines, Inc.,** recently organized, has purchased the leasing interest of the Denver Development Co. in the Little Pittsburgh mine on Pine Creek and has taken an option of 58% of the stock of the Pine Creek Lead-Zinc Co., owner of the Little Pittsburgh group. Denver Development has operated the property for the past nine years and has produced 241,541

tons of ore. Mascot Mines plans to sink the Little Pittsburgh shaft an additional 300-ft.

★**Four thousand North Idaho miners,** most of whom are members of the IUMM&SW union, have accepted the 10c per hour wage increase offered by Coeur d'Alene district mining companies. The offer is retroactive to Nov. 1. This brings the average wage of miners to $12.45 per day.

★**Bunker Hill & Sullivan Mining Co.** is building a new water storage tank to hold an estimated 2,000,000 gallons of water to be used during shortage periods.

★**Metropolitan Mining Co.'s south crosscut** from the 3100 ft. level in the Sunshine mine, has now reached a point 2875 ft. south of the Yankee Girl vein system and has now entered a fractured zone. The Big Creek fault is the objective point and is estimated to be 800 ft. ahead of the present face.

IRON COUNTRY

★The importance of an **adequate water supply for taconite concentration plants** was emphasized by E. V. Willard, Minnesota State Deputy Conservation Commissioner, in a talk befor the Duluth Chamber of Commerce. He said it might become necessary to pipe water into the taconite processing area from distant streams.

★**Steaming of iron ore,** frozen in transit from the iron ranges to Duluth and Superior, began Nov. 9. Except for brief intervals of mild weather, it will be continued until the end of the shipping season.

★U. S. Bureau of Mines **first aid training courses** were given during November at all Minnesota mines of the Inter-State Iron Co., including the Hill-Annex, Longyear, Grant, Columbia and Schley.

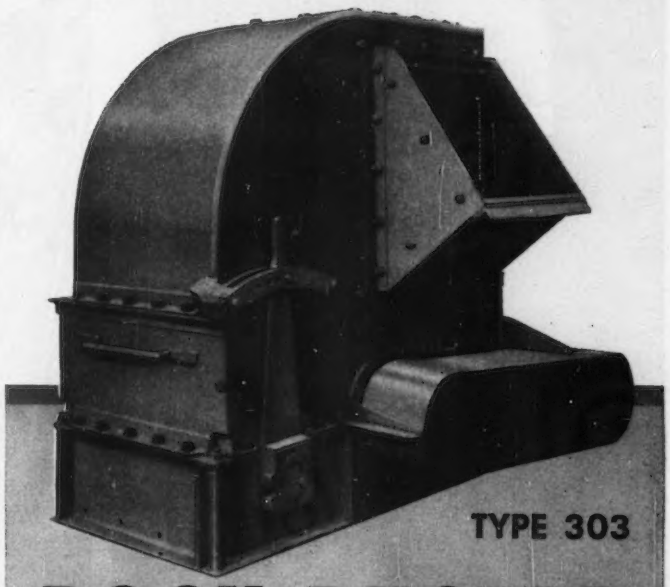
★On Nov. 16, **48 freighters were loading cargoes of iron ore** or waiting their turn at the Duluth-Superior docks, due to delays in unloading railroad cars caused by the necessity of steaming the frozen ore.

★Construction Aggregate Corp. has a large dredge, which was dismantled and shipped to Steep Rock from Boston, **removing lake bottom overburden from Steep Rock's "A" orebody.** Ore shipping will supplement production from area "B," which has provided all Steep Rock's shipments to date. "C" orebody is optioned to the Inland Steel Co., which diamond drilled it last winter.

★On Nov. 15, the National Production Authority allocated 10,000 tons of steel for January, February and March, for the **construction of 12 new ore vessels** to operate out of the Duluth-Superior harbor.

(*Continued on page* 111)

JEFFREY



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ROCK BUSTER

A NEW POWERFUL IMPACT CRUSHER FOR REDUCING HARD FRIABLE MATERIAL

This new Jeffrey Crusher, of impact type, reduces material while in suspension by means of a high speed rotor equipped with full-width stationary hammers, designed for the severest kind of duty. Material to be crushed is fed into the side of crusher onto a sloping grizzly of desired bar spacing. This grizzly serves the dual purpose of by-passing the fines and directing over-size material into path of rotor. Breaker bars adjustable—provide positive control over product size ranging from 1" to 4" in one pass through the machine. Capacity from 60 to 250 tons per hour.

Consult a Jeffrey engineer on your crushing needs

CONVEYORS • BUCKET ELEVATORS
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CHAINS AND TRANSMISSION MACHINERY

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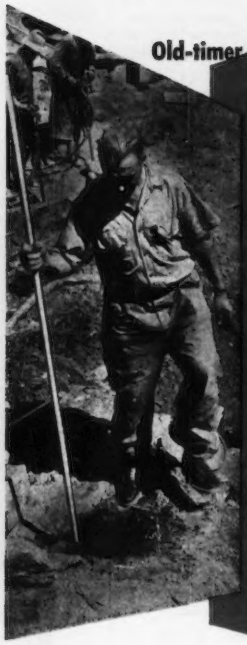


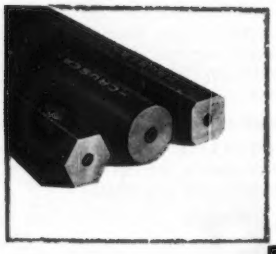
Old-timer Nick Pezzente says:

"hard rock, high air pressure, round-the-clock operation calls for

CRUCIBLE HOLLOW DRILL STEELS!"

That's Nick Pezzente, Blaster, Slattery Contracting Company, Inc., tapping a charge in the big hole for the new Chrysler Building Annex in New York City. Slattery Contracting does a major portion of the rock work around the New York metropolitan area, and Nick's an old hand at knowing by experience what it takes in drill steel to do the best job at *lowest cost per foot drilled*. He's been in this business for more than 25 years.

When the job calls for holing out hard rock, that's where Crucible *pretested* Hollow Drill Steels stand up and take it. Fewer lost bits—Crucible Hollow Drill breakage is cut to a minimum by gruelling tests on *every* lot before it gets to you.



And you get an extra when you do business with Crucible—our metallurgists and drill steel specialists can help you with those "special" jobs that take something different in drill steels. CRUCIBLE STEEL COMPANY OF AMERICA, Chrysler Building, New York 17, N. Y.

CRUCIBLE first name in special purpose steels

51 *years of* Fine *steelmaking* **HOLLOW STEEL DRILL**

HIGH SPEED • TOOL • STAINLESS • ALLOY • MACHINERY • SPECIAL PURPOSE STEELS

E & M J

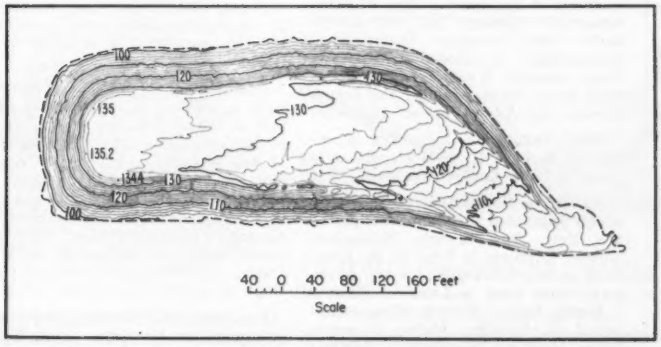
NEW PRODUCTS DIGEST

For further information on these products, circle item numbers on card—insert and mail.

PREVIEW

Cost Cutting with Air Surveys

AERIAL PHOTOGRAPH cut inventory costs on this coal stockpile and supplied a . . .



CONTOUR MAP, accurate within 3 to 5%, in a matter of days instead of weeks.

A RAPID, dollar-saving method of checking tonnage mined from your open pit, your dump or stockpile has been revealed in the results of the recent mapping of coal stockpiles. An air survey cut inventory costs 25%, provided inventory figures in a matter of days instead of weeks, and proved accurate within 3 to 5%.

Knowing the success of aerial mapping for reservoir studies, distribution maps, etc., the Philadelphia Electric Co. decided to try the method on its coal stocks, and checked costs with Aero Service Corp. Study showed that a pair of aerial photographs would do the job for each of 10 sites. Ground control required 4 elevation points and 2 horizontal points for each location.

When the plan received the green light, the photo-flight was scheduled for a clear day. The flight was made at 1200 ft. and the time the photos were taken recorded accurately.

Each 9x9-in. aerial view covered approximately 75 acres. They were photographed as overlapping stereo pairs which enabled compilers to trace contours for each stockpile with the aid of a stereo-plotting machine. From this total volume of the pile was computed and then the tonnage.

There is no reason why an aerial map could not be used to check the volume of ore mined from an open pit over a given period. An advantage here is that the tally is instantaneous, so that ore is not being removed during the inventory. The method can also be used to measure stockpiles and spoil banks without tying up the time of a lot of engineers.

Costs vary according to size of areas to be mapped, locations, airport facilities. For further information from Aero Service Corp., Philadelphia, Pa., circle No. 1 on the reply post card opposite page 110.

15 Years
..one BLOCK

A RECORD IN SLUSHER MINING

Installed in 1933 this Skookum Heavy Slusher Block was soon forgotten—forgotten because it performed its job perfectly for 15 years.

Attention was called to this Skookum Block only when it was noticed that there was less wear on the wire rope being used.

An extremely wide sheave and throat allows passage of a square knot in 1⅛-in. wire rope, especially designed to prevent wear.

- Manganese steel sheaves,
- Annealed cast steel sides,
- Timken bearings and Skookum patented grease retainers are responsible for 15 years of economical, trouble-free performance.

OTHER MINING STOCKS

Skookum slusher dragline blocks with alloy tool steel swivel crosshead.

T-8

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Skookum Guide Block. Used in conjunction with slusher blocks. Carries slack.

Specify SKOOKUM when choosing blocks

SKOOKUM CO., INC.

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NEW PRODUCTS DIGEST

NEW APPOINTMENTS among the manufacturers include that of William E. McCoy of Camden, N. J. (left), as assistant sales manager of the Central Division of Caterpillar Tractor Co.; J. L. McDermott (center) as district sales representative for Marion Power Shovel Co. in eastern Missouri and southwestern Illinois; and George B. Fahlstrom (right) as research and development director of Osmose Wood Preserving Company of America, Inc.

Memos from the Manufacturers

Link-Belt Co.: Bertram V. Jones appointed advertising manager to succeed the late Julius S. Holl. John F. Kelly will continue as assistant advertising manager.

General Electric: Allan L. Davis appointed manager of service of the transportation divisions, apparatus department; J. T. Farrell named assistant to the manager of sales of Small and Medium Motor Divisions; Howard W. Bennett and Paul D. Ross named managers, respectively, of the new Gear-Motor and Packaged Drive Sales Division, and the Erie (Pa.) D-C Armored Motor Sales Division; H. M. Wales appointed district sales manager for two-way radio communications equipment in the Commercial Equipment Division with headquarters in Syracuse; Joseph F. Eckel appointed manager of the Large Motor and Generator Divisions at Schenectady; to succeed J. M. Crawford, recently transferred to Pittsfield, Mass., as manager of the Transformer and Allied Product Divisions.

SKF—Industries, Inc.: New president is Richard H. DeMott, who succeeds William L. Batt, resigned.

Raybestos-Manhattan, Inc.: Recently appointed assistant manager of the New York branch, Manhattan Rubber Division, is John T. M. Frey. New assistant manager of the Abrasive Wheel Dept. is Lamar S. Hilton.

Eimco Corp.: Branch office established in Kellogg, Idaho, to serve Idaho, Montana, Washington and Oregon, with Bryan Dickenson as manager.

Chain Belt Co.: Edmund Fitzgerald, president of Northwestern Mutual Life Insurance Co., elected a director to fill the vacancy created by the death of Walter Kasten.

United States Steel Corp.: New general sales staff manager for subsidiary Gerrard Steel Strapping Co. is Arthur W. Carlquist; Charles H. Eisenhardt named manager of Electrical Products Sales Division of subsidiary American Steel & Wire Co.

H. K. Porter Co., Inc.: Lawrence L. Garber named general manager of American-Fort Pitt Spring Division; B. C. Blake appointed vice president and general manager of Conners Steel Co., division of the Porter company, to succeed H. P. Bigler, resigned.

Allis-Chalmers Mfg. Co.: Elected vice president in charge of research is Dr. H. K. Ihrig, who recently resigned as vice president and director of Globe Steel Tubes Co.

Inland Steel Co.: Victor E. Schlossberg appointed assistant chief engineer of Indiana Harbor Works; Henry N. Schumacher made superintendent of cold strip mill; William J. Walsh, new superintendent of tin plate department; railroad division and pig iron and coal chemicals division of the company's sales department have been consolidated in charge of John J. Davis, Jr., with L. C. Reed and A. C. Engh as assistant managers of sales.

Westinghouse Electric Corp.: Appointment of Dr. John C. R. Kelly, Jr., Martin F. Quaely, Dr. Robert B. Windsor and Robert Archer to the Lamp Division's research staff announced recently.

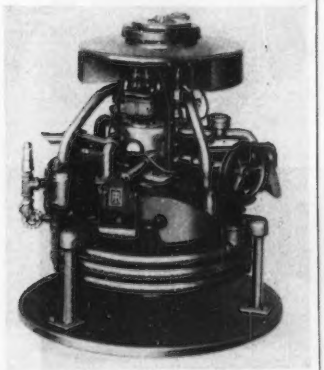
New Tournatow Uses Diesel Electric Drive

With its own diesel engine providing electric power for driving, steering, and for the winch, easy handling and smooth operation make the rubber-tired Tournatow, just announced by R. G. LeTourneau, Inc., Peoria, one of the outstanding developments in the heavy equipment industry. A full description of the new machine will feature February's new Products Digest. (50)

The Dorr Co.: Paul Kite promoted from assistant manager to manager of the Development Dept.; Dr. Anthony J. Fischer, formerly sanitary development engineer, promoted to assistant manager of Development Dept.; Bryant Fitch promoted to assistant research director; Eastern Sales offices, until recently located at 570 Lexington Ave., New York, moved to company's general office location at Barry Place, Stamford, Conn. A branch office will be retained at the New York address.

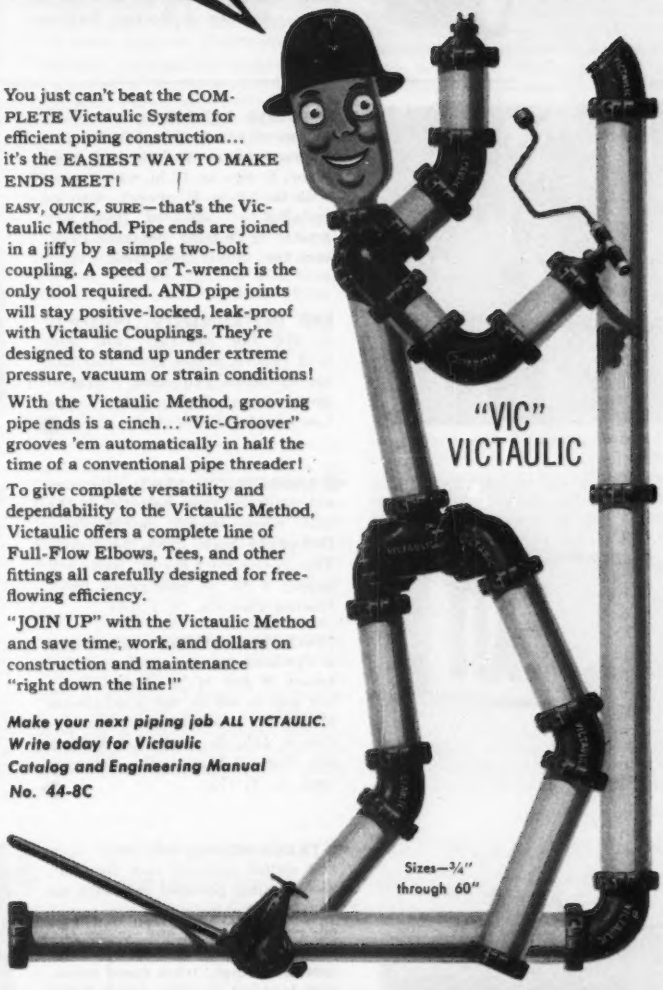
National Lead Co.: General offices of the Baroid Sales Division, including sales, administrative and research departments, to be moved from Los Angeles headquarters to Houston.

International Harvester Co.: F. J. Schrock, assistant general supervisor of service, industrial, has been given complete responsibility for industrial service during the absence of W. W. Black, general supervisor, who has been transferred for an indefinite period to the company's Government work; Leo Burnett, Inc., to handle advertising for industrial power products.



COMPRESSOR weighs only 265 lb., stands 32 in. high on 27 in. baseplate. Gasoline-driven Spot-Air delivers 36 cfm. at 80 psi. Ingersoll-Rand Co., N. Y., N. Y. (20)

RIGHT IN THE GROOVE



You just can't beat the COMPLETE Victaulic System for efficient piping construction... it's the EASIEST WAY TO MAKE ENDS MEET!

EASY, QUICK, SURE—that's the Victaulic Method. Pipe ends are joined in a jiffy by a simple two-bolt coupling. A speed or T-wrench is the only tool required. AND pipe joints will stay positive-locked, leak-proof with Victaulic Couplings. They're designed to stand up under extreme pressure, vacuum or strain conditions!

With the Victaulic Method, grooving pipe ends is a cinch..."Vic-Groover" grooves 'em automatically in half the time of a conventional pipe threader!

To give complete versatility and dependability to the Victaulic Method, Victaulic offers a complete line of Full-Flow Elbows, Tees, and other fittings all carefully designed for free-flowing efficiency.

"JOIN UP" with the Victaulic Method and save time, work, and dollars on construction and maintenance "right down the line!"

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27TH VICTAULIC YEAR

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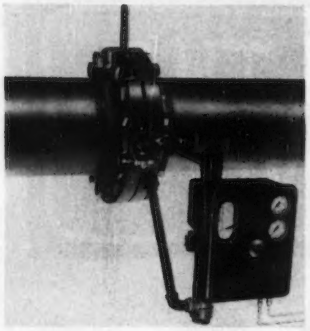
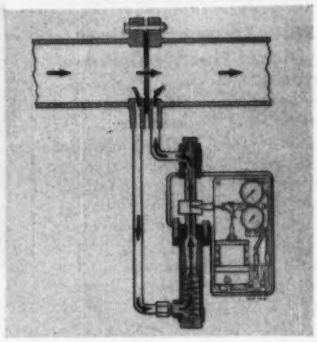
The easiest way to make ends meet
VICTAULIC
PIPE COUPLINGS AND FITTINGS



Flow Meter Is Mercury-less

Using no mercury nor a diaphragm of any kind, V/A cell is a direct connected differential pressure instrument which converts main-line flow into proportional air pressure and transmits this pressure to receiver instruments. You can use this for liquid, gas, or vapor streams within reasonable limits of viscosity or solids-content. Parts in contact with the fluid are made from stainless steel. Range is from 50 to 1,400 in. water. Fischer & Porter, Hatboro, Pa. (3).



POWER DIGGER for trenching and small excavations fills the gap between power shovels and hand labor. It digs an 18-in. wide trench with its 3.5-cu. ft. shovel. Can be installed or removed from any tractor in 20 min. Sherman Products Inc., Royal Oak, Mich. (4)

EAR INSTRUMENTS designated as the Lee Ear-Valv, will stop loud sudden noises from reaching the ear drum yet admit conversational tones. Sigma Sales Corp., Los Angeles, Calif. (5)

EMERGENCY LIGHT operates automatically from batteries in the unit when outside power fails. Downward beam lights floor area. The 14¾ x 8½ x 4½-in. unit will supply 8 hr. of emergency light. Electric Cord Co., N. Y. (6)

1½-TON BATTERY TRAMMER is available for any track gage between 18 and 24 in. Rated drawbar pull is 400 lb. but a maximum of 750 lb. is obtainable. Locomotive is 44⅛ in. high, has folding cab. General Electric Co., Schenectady, N. Y. (7)

TRACKMOBILE will haul, spot and switch railroad cars for you. The gasoline powered unit with its hydraulic jacking power can travel on road or rails and make the switch in just 30 seconds. Ground speed is 25 mph; track speed varies with load but drawbar pull is 7,350 lb. Whiting Corp., Harvey, Ill. (8)

TELEVISION tells this scrap baler when the freight car he is filling is loaded so that he can move it with automatic controls and bring in another car. (9)

For Your Files

This informative manufacturers' literature is free unless otherwise specified. To obtain bulletins circle their numbers on card below and mail.

HOISTS. A 4-page illustrated booklet, S-151, describes briefly the Northern line of Super cranes, Hi-Lift cranes, electric hoist cranes, Hi-Lift hoists, and Travelators, with list of users of Northern overhead material handling equipment. Northern Engineering Works, Detroit, Mich. (71)

PUMPS. Bulletin 7233 gives you an intimate picture of multi-stage, horizontally split centrifugal pumps for pressures up to 1200 psi., made by Ingersoll-Rand Co., New York, N. Y. (72)

POWER SHOVEL. Bulletin No. 401, outlining the design and operating features of the Marion Type 93-M Ward-Leonard electric machine has just been published by Marion Power Shovel Co., Marion, Ohio. (73)

MOTOR GENERATOR SETS. An 8-page, two-color booklet, GEA-5506, covers motor-generator sets from 30 to 8,000 kw. as a source of d.c. power for many industrial applications. General Electric Co., Schenectady, N. Y. (74)

POWER UNITS. "High production, Low Costs. . . . With International Pit and Quarry Power" brings you 6 pages of pictures from various quarries, testimonials and a work capacity chart covering all of the carbureted and diesel power units manufactured by International Harvester Co., Chicago, Ill. (75)

WELDING. "How to Weld with Heliarc Torches" gives 28-pages of detailed information on welding, surfacing and hardfacing of many commercially used metals. Properties of each metal, sketches show types of weld and thickness of materials, tables of welding current, rods, electrode diameter, welding speeds and types of joints are included in booklet F-6190, available from Linde Air Products Co., New York, N. Y. (76)

RUBBER PIPE. Economies in installation and maintenance of rubber pipe are explored in Hewitt-Robins Inc.'s 8-page Bulletin H-1. Applications of flexible rubber pipe, and comparison with metal pipe are interesting. (77)

VALVES. Changes and improvements in the line of pressure reducing and regulating valves are covered in Bulletin 283 of A. W. Cash Valve Mfg. Corp., Decatur, Ill. Bulletin also describes the new automatic reseating relief valve. (78)

WELDING. "Manual of Welding Engineering and Design" contains a large amount of practical information on welding practice with data covering the use of Eutectic Welding alloys. Copies of the manual are available without charge but the company would like your request in writing. Address your request to Technical Information Service, Eutectic Welding Alloys Corp., 40 Worth St., New York 13, N. Y.

LOADER. A new loader for trackless mining, the Goodman 665 shows what it can do in this 4-page bulletin. While the reference in this bulletin is to coal, other mining men, particularly those mining softer rock, should find this tractor tread loader of interest. Goodman Mfg. Co., Chicago, Ill. (79)

WIRE ROPE. This catalog on wire rope for excavating equipment has a unique feature. Under the heading "Recommendations," the publisher, John A. Roebling's Sons Co., Trenton, N. J., has listed actual recommendations for specific usages and has included the wire rope code which has not been published before. (80)

COMPRESSED AIR. Protection of air-powered tools, gages and process equipment against air-borne impurities is the subject of Bulletin 176, published by R. P. Adams Co., Inc., Buffalo, N. Y. Illustrated with 8 color cutaway views, the 8-page, file-size bulletin describes equipment for removal of water, oil and pipe scale from compressed air systems. (81)

VIBRATING SCREENS. Link-Belt "CA" concentric action vibrating screens for medium and heavy duty service, sizing, rinsing and rapid dewatering of a wide range of materials, from ashes to zinc ore, are illustrated. described and tabulated in a new 12-page book (No. 2354), put out by Link-Belt Co., Chicago, Ill. (82)

CRANES. This 20-page book with more than 50 illustrations covering the application of Lorain cranes to industrial material handling, has been produced by the Thew Shovel Co. (83)

CONCRETE BINS. Maybe concrete storage bins are the answer to your binning problem. There is a lot of information about their construction and use in this folder offered by Neff & Fry Co., Camden, Ohio. (84)

SKIPS AND CAGES. This elegant brochure illustrates, describes and lists the advantage of aluminum alloy skips and cages. The publication also includes some notes on the mechanical parts of hoisting engines which the company makes. Vickers, Ltd., London, England. (85)

DIAMOND DRILLING. Bulletin No. 82 has a lot of notes and pictures on Longyear diamond drills and drilling equipment. The back page gives you some information on such services as contract core drilling, contract shaft sinking and mine development, and geologic investigations and valuations of mining properties. E. J. Longyear Co., Minneapolis, Minn. (86)

DIESEL ENGINES. A 28-page booklet, "10 Questions to Ask a Diesel Engine Salesman," is the gimmick here for describing in detail the advantages of the diesel engines made by Murphy Diesel Co., Milwaukee, Wis. (87)

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Equipment Shorts

LUBRICATION. A new line of angle sight feed valves for pressure or gravity oiling systems allows the flow of oil to be visually checked and closely regulated. They can be used singly or gang-mounted for central control of multiple oiling. Aluminum alloy construction makes for light weight. Oil-Rite Corp., Milwaukee, Wisc. (31)

TRUCKS. The 1951 Ford trucks are on the market with more than 180 models designed to reduce operating costs, make trucks adaptable to more jobs and to add to driver convenience and comfort. Ford Motor Co., Dearborn, Mich. (32)

TRACTOR-SHOVEL. Faster, more rugged and more powerful are the manufacturer's claims for the new model HA Payloader. This small, compact 12- cu. ft. tractor-shovel is widely used in handling of bulk materials. Frank G. Hough Co., Libertyville, Ill. (33)

LIGHTING. Low-voltage portable lighting system, the Joy-Lite, is powered by compressed air. Output of 250 to 280 watts, enough power to operate 4 high-powered sealed-beam flood or spotlights, has an air consumption not exceeding 25 cfm. Unit weights 48 lb. Joy-Lite Mfg. Co., Pittsburgh, Pa. (34)

HOLDBACK. Roller-type holdback is designed to prevent reversal of inclined conveyors and bucket elevators when power is interrupted. A hardened steel roller floats between a wedge plate and a drum, keyed to the head shaft. When the head shaft changes direction of rotation because of power failure, the steel roller is wedged between the drum and the plate, stopping motion without shock. When power is reapplied, the holdback releases immediately. Stephens-Adamson Mfg. Co., Aurora, Ill. (35)

REMOTE CONTROL. Electric remote control for Sterling Speed-Trol (Variable speed) electric power drives, may be mounted on any size Speed-Trol of current design by the user in the field. It is also available with new Speed-Trols at the factory. (36)

TUMBLING MACHINE. For grinding, de-burring and finishing metal parts, this tumbling machine employs the Grav-i-Flo process to produce high lustre surfaces. With its 2 compartments the machine's dimensions are 68 x 64 x 68 in. The 220 - 440-v., 5-hp. motor has a magnetic starter and brake. Water and electrical connection are conveniently located. Gravi-i-Flo Corp., Sturgis, Mich. (37)

TRUCKS. In discussing the 1951 Chevrolet trucks, the manufacturer is emphasizing newly designed "Twin-Action" brakes on rear wheels for increased braking effectiveness, adjustable ventipanes for better cab ventilation, and new seat construction. General Motors Div., General Motors Corp., Detroit, Mich. (38)

CIRCUIT BREAKERS. Except for a few experimental models, the new 69-kv. Westinghouse compressed-air circuit breakers are the first in this country for voltages above 34.5 kv. Units carry 2,000 amp. and have a 3,500,000-kva. interrupting capacity. Westinghouse Electric Corp., Pittsburgh, Pa. (39)

SELF-RETRACTING TAPE. Here's a 50-ft. steel tape that rewinds automatically, eliminating hand cranking and reeling. Simple thumb pressure starts the rewind which takes only 10 seconds for the entire 50 ft. This should eliminate dragging and laying aside between measurements, the cause of most steel rule damage. Trade-named Master Longboy -050, it retails for $12.00. Alternate 50-ft., tapes may be had for $6.00. Master Rule Mfg. Co., Middletown, N. Y. (40)

VARIABLE SPEED TRANSMISSION. New variable speed transmission series with the Worthington tandem belt design, will consist of 6 models rated from one to 15 hp. with ratios from 16:1 to 6:1 respectively. Handwheel control will normally be furnished but electrical remote controls are available where required. Worthington Pump and Machinery Corp., Harrison, N. J. (41)

CONVEYOR ROLL BEARINGS. M-R-C improved conveyor roll bearings feature (1) freedom from need of lubricating, (2) improved bearing seal, (3) all exterior surfaces rust resistant, (4) easily replaceable. The manufacturer claims that these result in (1) reduced machining operations, (2) cheaper mounting costs, (3) reduced belting cost, and (4) improved belt alignment. Marlin-Rockwell Corp., Jamestown, N. Y. (42)

UTILITY GRINDER. For those odd jobs around the shop, this grinder has two 6-in. dia. wheels (one coarse, one fine grit) with ¾-in. face, powered by a ¼-hp., 220 or 440-v motor. Lima Electric Motor Co., Lima, Ohio. (43)

PROTECTIVE COATING. Steel battery trays are well protected from corrosion by coating which although easily applied, bonds itself to the steel. Hard blows will not chip coating off and it is also claimed to have high insulating quality, protecting trays from corrosion due to the leakage of current. Exide Storage Battery Co. (44)

HEAT MEASUREMENT. Completely integrated series of radiation measuring instruments records temperatures from 125° to 7,000° F. of large surface areas, where work moves or rotates or where temperatures are above thermocouple range. Minneapolis-Honeywell Regulator Co., Philadelphia, Pa. (45)

PHOTO-COPYING. An easy, versatile system for reproducing letters, reports, office records, sketches, drawings, etc., is time saving and economical. You can use photography from planning to production with the Portagraph. Remington Rand Inc., New York, N. Y. (46)

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Iron Country *(Continued)*

★American Ship Building Co. will build the **largest inland waterway ship ever constructed** for the M.A. Hanna Co. at its Lorain, Ohio, yards. It is to be ready for the 1952 ore season and will cost about $6 million. The ship, which will have a 690-ft. over-all length, will be 12 ft. longer than Inland Steel Co.'s Wilfred Sykes, which went into service last year, and will have a capacity of over 20,000 tons with a speed of about 16.5 miles per hour.

★Beginning about the middle of November, the **Grant mine at Buhl went on a five-day week** after having worked six or seven days through most of the shipping season.

★**Snyder Mining Co.** will operate on four forties which include the old Whiteside underground mine at Buhl. Two of the forties were owned by the Snyder company and two were purchased from Oliver Iron Mining Co.

★**Oliver Iron Mining Co.** will open a new mine at Coleraine early this winter. Named for the late Alexander King, general superintendent in the Canisteo district for many years, it will be known as the King mine. R. T. Elstad, president of the Oliver company, states that the mine, which will be an open-pit, combination rail and truck operation, will extend southwest of the present Canisteo open pit and is located north and west of Coleraine. Over 15 million cu. yd. of dirt and 3 million cu. yd. of rock will be moved to strip the property. Ore will be treated at the Trout Lake concentrating plant.

★St James Mining Co. **began stripping the St. James mine at Aurora,** last operated in 1942 by Corrigan, McKinney Steel Co., in November. Oglebay, Norton & Co., agents for the St. James company, are operating the property.

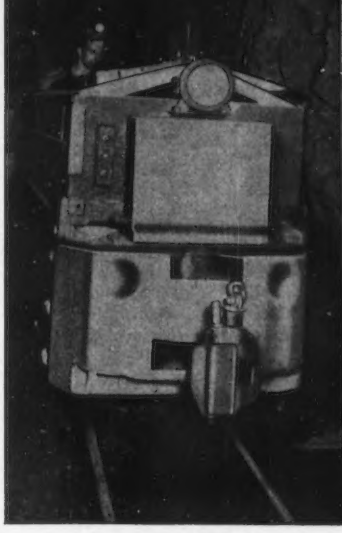
★On Nov. 24, the Voorhees of the Pittsburgh Steamship Co. and the Elton Hoyt of the Interlake Steamship Co. collided off St. Helena Island, causing extensive damage to both vessels. However, both were able to proceed under their own power to Mackinaw City, where they will receive repairs.

★Stripping, begun at the **Morton mine of M. A. Hanna Co.** last January has proceeded at a brisk rate. The company estimates that about 35 million cu. yd. of surface will be moved in addition to the taconite. The bulk of the dirt will be handled by the 1150 B. dragline and conveyor. With a maximum digging capacity of 2,000 cu. yd. per hour, it is taking 60-ft. cuts in an east-west direction.

★Oliver Iron Mining Co.'s **new taconite plant at Virginia** is proceeding rapidly and construction work will be continued through the winter.

★According to reports, the Great Northern Railroad had handled 720

How to keep them ON THE GO!



SHREWD MINE operators know that bogged-down locomotives, trammers or shuttle cars bring on blocked right-of-ways, snarled schedules and upped production costs.

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Iron Country *(Continued)*

cars of ore as of Nov. 30. With ore freezing in cars and steaming necessary before it can be unloaded, a mine is not furnished empties until a boat is ready to receive the ore. No definite date has been set for the ending of the ore season, but prospects are that the close will come earlier than had been hoped.

★**Cleveland Cliffs Iron Co.** is buying a Victory ship from the Government to convert it into an ore carrier by next year. The purchase was made because of an acute need for iron ore transportation units on the Lakes. Shipyards building lake ships have orders that will carry them to 1953.

MICHIGAN

★**The Michigan legislature will be asked to appropriate $1 million** for the establishment of a research laboratory and pilot plant at the Michigan College of Mining & Technology at Houghton for experimental purposes in the treatment of low-grade iron and copper ores. Representatives of the mining companies operating in the Upper Peninsula are agreed that this project would be of inestimable value to their industries and to the state.

★Castile Mining Co. has suspended operations at its **Eureka mine,** which has been operated by Oglebay, Norton & Co. Pickands, Mather & Co. has taken over the Eureka shaft for Youngstown Mine Co. and will use it as an outlet for removing ore from an adjoining property.

★Employee voting on the union shop clause at the **Bristol mine** of Inland Steel Co. at Crystal Falls resulted in a closer decision than has usually occurred. With 76 eligible to vote, 39 voted for the union shop, 19 against it, and 18 failed to vote.

★Jones & Laughlin Ore Co. is preparing to open and develop the **Tracy mine** at Negaunee on property acquired from the Breitung interests in 1921. Formerly a major producer on the Marquette range, the company had obtained most of its ore supply from the Mesabi since 1919, until the opening of its Benson mines at Star Lake, N. Y.

It is estimated that the Tracy mine will require over 650 men when its schedule of one million tons per year is reached.

★**Ore shipments from Michigan ranges** began to experience delays due to ore freezing in railroad cars about mid-November, with a considerable tonnage still scheduled to be forwarded.

★**Cleveland-Cliffs Iron Co.** is diamond drilling at the eastern side of Ishpeming. It plans to drill through the Negaunee formation in the area if possible, which may require holes of 4,000 ft. or more in depth.

★Cleveland-Cliffs Iron Co. has set up one of the **best equipped mine rescue stations** in existence at its Mather "B" mine. Its facilities, which include a smoke tunnel where rescue crews may receive training under real fire conditions, will be available for other mine operations on the Marquette range. All equipment is of the latest design and is complete in every detail.

MONTANA

★In a letter to stockholders, J. F. Featherstone, president of the **Commonwealth Lead Mining Co.**, stated that the lead-silver ore now being shipped from its property near Melrose is averaging better than $100 per ton. The ore was discovered Sept. 1, 1950, about 1,200 ft. north of the point where the ore was lost several years ago.

NEVADA

★**Round Mountain Gold Dredging Co.**, operating its giant plant in Nye County, is working toward the deeper gravel deposits which at some points are at the 300-ft. level. During the last several months the big plant has been working at near capacity and producing gold at a reported rate of $3,400 daily.

One of the world's largest electric shovels is used in the operations, and the washing plant handles a minimum of 17,000 tons of gravel daily. The property, which covers several thousand acres, is leased from Nevada Porphyry Gold Mines and is estimated by the operators to contain 67,000,000 tons of gravel expected to yield 20 to 26c. a ton. Operations are expected to continue for at least 15 years.

★Extensive development work is in progress at the **Juanita gold mines** in the Columbia mining district. A new air compressor is on the site, and a new boarding house, bunk house and compressor house are being constructed. The Juanita has a 104-ft. shaft and a 615-ft. tunnel developed by the Juanita Mining Co. some time ago.

★**Southwest Dredging Co.**, which is operating a dragline and dryland dredge in the Spring Valley placers in the Rochester mining district, is reported to be handling about 3,000 cu. yd. daily. Warm water is supplied by two wells, which facilitates work during the cold weather. The company was Nevada's second leading placer gold producer last year.

In the same area Spaulding Canyon Mining Co. has added a bulldozer and carryall to the plant at its Spaulding Canyon placers; and the Constant Minerals Separation Co. has installed a washing plant and other equipment in the Rabbit Hole sector of the Rosebud region.

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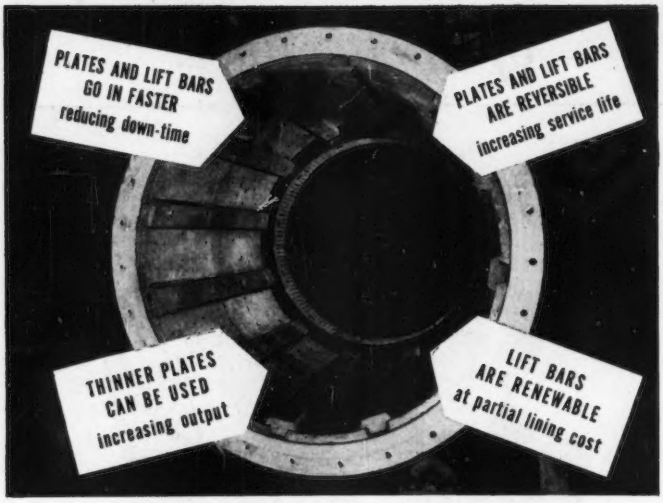
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PLATES AND LIFT BARS ARE REVERSIBLE increasing service life
THINNER PLATES CAN BE USED increasing output
LIFT BARS ARE RENEWABLE at partial lining cost

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LORAIN ROLLED PLATE LININGS AND U·S·S GRINDING BALLS

1-138

USS UNITED STATES STEEL

Nevada (*Continued*)

★Due to the fact that the Stateline Mill is now handling custom ore, **activity is increasing in the Goldpoint district** in Esmeralda County. M. Dawes, of Long Beach, Calif., is rehabilitating his Tokop-Wonder property, and has leased his Hornsilver mine to Tom Beard. John Hall is working the Little Johnnie placer south of Goldfield by the dry washing method and reports a profitable operation.

★**Plans to sink an exploration shaft** at a location ½ mi. south of Tonopah in Nye County have been announced by J. V. Grismer, Wallace, Idaho, mining man. The proposed work will be financed and under direction of the Trader Horn Mines Inc., of Spokane, Wash. A compressor, gas hoist and drill steel will be installed, and three men will be employed on the project.

★Western Aloys, Inc., which is **producing manganese ore** in Humboldt County and hauling it daily to Valmy, has petitioned the Humboldt County commissioners for a road improvement project in that area. Marigold and Reid Brothers, also operating mines in the Valmy section, joined in the request.

★Following completion of a well to furnish water for domestic, mining and milling purposes, **activity has increased at the reorganized Silver King Divide Mining Co. propery near Austin.** The mine is a gold-silver producer in the Newpass district.

★New York interests are drilling an exploratory hole at the Inca group, part of an extensive property comprising 64 claims in the Gold Mountain area 2 mi. west of Tonopah. Drilling is proceeding about 1,500 ft. from ore deposits formerly mined through the McKane shaft.

★**The Newmont** mill in Goldfield is running intermittently on gold ore produced by lessees from the White Horse property of Goldfield Deep Mines Co. Ore milled recently included about 300 tons averaging a reported $355 per ton from the Red Hill Florence Lease, and 120 tons sampling close to $70 per ton, mined by George Metscher and associates. Concentrates are shipped to a Utah smelter.

★Incorporation of the **Gray Eagle Development Co.**, which owns a lead-zinc-silver mining property at Beowawe in northern Lander County, has been completed. Work at present is being carried out through the Hovendoen tunnel with stoping of a good grade shipping ore from the Edwards stope. Ore is being mined for shipment to Utah smelters, and has assayed 16% lead, 1.8% copper, 40 oz. of silver, .31 oz. of gold, and 5.7% zinc per ton. Five men are employed in stoping and sinking operations.

★M. Dawes, well known Goldfield mining man, has acquired title to a **talc mining property** in the Palmetto dis-

tric of Esmeralda County on a $20,000 lease and bond deal. It consists of one claim, and has four shafts which have a production record of 20,000 tons of talc material. Dawes says he plans to start shipments at once, and expects to produce 50 tons daily. The material will be trucked 130 mi. to a mill at Keeler, Calif.

NEW MEXICO

★The Oraquay Mining and Milling Co. is operating two mills at its **lode gold mining operation** near Golden, New Mexico, where the first gold mining in America was done in 1828.

★The U. S. Bureau of Mines, through a report by R. L. Bolmer and A. W. Worcester, has given approval of the use of a diesel bulldozer at the potash mine of **International Minerals & Chemical Corp.** at Carlsbad. The equipment used for experiments underground, including an exhaust gas scrubber, was designed and built by International engineers and craftsmen using information supplied by the Bureau, based on experiments conducted at Rifle, Colo. The regulations that have been set up may open a new field of power for underground equipment, the company thinks. They could be applied to any non-coal mine when the conditions set forth by the Bureau are met.

★The 1951 annual meeting of the New Mexico Miners and Prospectors Association will be held at Albuquerque Feb. 15 to 17. The Hilton Hotel will be headquarters. President William H. Goodrich has put the following committees to work:

General Arrangements: George A. Warner, chairman and E. C. Iden, of Albuquerque; C. F. Williams, Santa Fe; Horace Moses, Santa Fe; A. J. Thompson, Socorror.

Program committee: V. C. Kelley, chairman, G. R. Griswold and E. P. Chapman, Jr., of Albuquerque; J. P. Smith, Carlsbad; T. A. Snedden, Vanadium.

★Dave Burt, geology student at the University of New Mexico, Albuquerque, and a former parachute jumper for the U. S. Forest Service and paratrooper, **has established a parachute cargo dropping service** for the benefit of small mine operators and prospectors in isolated parts of this state, much of the cargo will be dropped with disposable parachutes. Small planes will be used and they will drop cargo from low altitudes.

NORTH CAROLINA

★**Minerals Reclamation Corp., Inc.,** of Asheville, has obtained a certificate of incorporation from the North Carolina secretary of state to deal in mineral products with authorized capital stock of 500 shares of no par value.

The more elusive the ore the greater the need for

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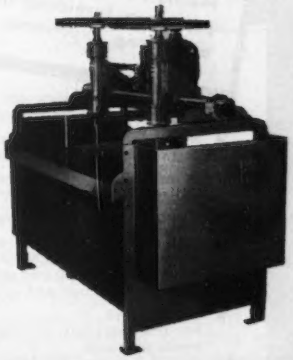

We invite your inquiry through personal interview or detailed correspondence. Our experimental ore testing work moves with precision and dispatch. Usually, the problem is far easier to solve than you might imagine. Confer first with a Galigher engineer!

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- Carbon steel. For fine materials and high heads, or where an easily welded metal is desired.
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- Various stainless steel alloys. For extreme corrosion and abrasion resistance.
- Cast iron, rubber lined. Where operating conditions are right for this construction and when suitable rubber is available.

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North Carolina *(Continued)*

★**Franklin Developers, Inc.**, of Franklin, has obtained a certificate of incorporation from the North Carolina Secretary of State to deal in minerals and mineral products with authorized capital stock of $100,000.

OREGON

★**Settlement of a dispute between CIO steel workers and six plants of the Reynolds Metals Co.** was made on Nov. 18. It was agreed that a recent 10% pay increase was to be made retroactive to Oct. 1. The union also won the right to reopen wage negotiations in April, 1951, effecting a contract that will run until April, 1952.

★A placer property near Bridgeport, south of Baker, has been taken over by G. I. Wild and Earl A. Pack. Coarse gold with nuggets as high as $40 each, and also some platinum, were reported.

★Chromite deposits in Del Norte County, Calif., and across the line in southern Oregon are under investigation, it is reported from Portland. Small shipments have been made to a stockpile at Grants Pass.

★M. A. Hanna Co., of Cleveland, has been **developing a major nickel project**, 10 miles south of Roseburg, and have had favorable tests, F. W. Libbey, Oregon State Director of Geology and Mineral Industries, reported. A pilot plant is under consideration and additional drilling will be continued at the property this spring.

★Following disclosure of **many mineral claims on portions of the Rogue River National Forest**, investigation of mass filing of the claims has been proposed by President F. I. Bristol of the Oregon Mining Association. He urged "a thorough investigation by mineral experts" in the best interests of the mining industry.

★Continental Chemical Co., which is producing manganese at its Salem plant from low-grade ore mined in northern California and Nevada, has announced that it is **in the market for more manganese ore. It will pay 45c** a unit per long ton f.o.b. shipping for ore which runs not less than 25% Mn. Ore as low as 20% Mn will be accepted, but the price would be reduced 2c. a unit for each percent below 25. Each percent is a unit, hence 25% ore would be worth $11.25 per long ton at railhead. The company suggests that average samples be submitted for analysis before shipment is made.

TRI-STATE

★The Ballard mine of **St. Louis Smelting & Refining Co.** resumed operations No. 27. The men have returned to their jobs, but the strike has not been

settled. Negotiations will continue as the miners, members of IUMMSW voted to return to their jobs and continue their talks with the mine officials. The union is asking a rise in wages of 20c. per hour and also seeking the elimination of the sliding scale. By this arrangement, which has been in use in this district for many years, the miners' wages are increased and decreased in proportion to the price paid for zinc ore. The present price of $115 per ton is about twice that paid last spring. The miners recently took a drastic cut and are not content with the wage increases since that time. At a recent meeting the union rejected the mine owner's offer of an increase of 5c. per hour and an extra holiday with pay.

TEXAS

★Some 700 workers of the **American Smelting and Refining Co.** returned to work at El Paso, Nov. 10, after a three-day strike over a 10-day layoff of a plant worker.

Members of Local 509, IUMM&SW, returned to work after the union agreed to arbitrate the dispute, as required by the collective bargaining contract.

Originally, when the members of the union walked out, they are said to have charged that the lay-off was an attempt to initiate a "speed-up" at the plant by improvising penalties for non-performance of arbitrary work standards.

The company officials said the lay-off was merely a case of an individual failing to do work and being disciplined for it. They charged the union failed to live up to its contract provisions for the settlement of grievances.

The agreement to arbitrate which ended the strike was arrived at after a lengthy conference between E. McL. Tittman, smelter manager, and representatives of the union, and put up to the arbitrator the question of whether the employee had been guilty of misconduct.

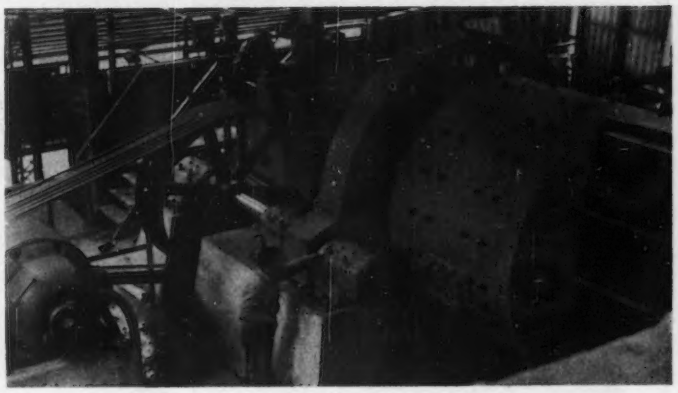
UTAH

★Official dedication ceremonies marking the **completion of Kennecott Copper Corp.'s $16-million electrolytic refinery** at Garfield highlighted the month of November in the state. Thirteen of the fifteen directors of the corporation were on hand for the dedication Nov. 15 and a three-day tour of Kennecott facilities.

★The cross-cut into **new ground being explored** on Park City property, jointly owned by Park Utah Consolidated and Silver King Coalition Mines Co., has advanced more than 320 ft., according to a report from Paul H. Hunt, vice president and general manager of Park Utah.

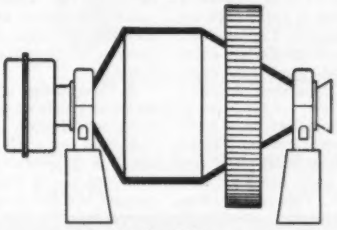
Objective of the cross-cut from the

PERUVIAN LEAD-ZINC OPERATION ADDS SECOND CONICAL MILL



Hardinge 8' x 60", 500-ton Conical Ball Mill in the new concentration plant of Cia. Minera Atacocha. This mill began operation in March, 1950.

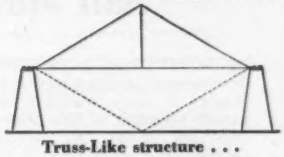
Cia. Minera Atacocha, a lead-zinc mining concern in Lima, Peru, recently installed their second large Hardinge conical mill. The first was a 7' x 36" mill. Both are fed by Hardinge Constant-Weight Feeders.



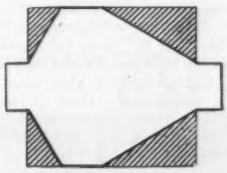
Less dead weight . . .

The new Hardinge mill tripled the grinding capacity of the entire operation.

The principle of the Conical Mill is sound. Note that the longitudinal cross section forms a truss. Strength is obtained without massive construction. Excessive dead weight, extra power and high operation costs are eliminated. Balls, and material, are segregated by size, becoming progressively smaller toward the discharge end. Thus, grinding energy is roughly proportional to size of material ground. Write for Bulletin AH-389-1 if you grind wet; 17-B-1 if you want information on dry grinding.



Truss-Like structure . . .



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E&MJ REPORT

No. 1 service shaft is down 1,463 ft.

No. 2 exploratory shaft is down 1,650 ft.

San Manuel's Ore Proves Caveable

OBJECTIVES AND PROGRESS of San Manuel's development program were reported in July, 1949, by Wesley P. Goss, manager of Magma Copper Co., parent company of San Manuel. (See E&MJ July, 1949, pp. 92-95). An account of what has been accomplished since then at this important Arizona copper property follows.

The four-compartment No. 1 shaft has been sunk to 1,463 ft. It is equipped with steel sets and lined with reinforced concrete. Surface installation of the shaft includes a steel headframe, steel ore bins, and a hoisthouse. (See photograph.) This shaft was located well in the footwall to serve as a permanent installation for ventilation and supplies, and possibly for hoisting ore if required.

No. 2 shaft was down to 1,650 ft. as of Nov. 30, 1950. It is heavily timbered and jacketed. Purpose of this shaft is to penetrate the heart of the Southeast orebody and reveal such vital information as the caveability, drainage characteristics, detailed extent of the orebody, as well as a check on the grade of ore indicated by churn drilling.

Present shaft installations include a pump and transformer station on the 975 level; a station, pocket, and some drifting on the 1285 level; a station, pump installation, sump, 440-v. and 2,300-v. transformer station on the 1475 level. All station installations are concreted. Concrete is batched and mixed at the No. 2 headframe and piped down the shaft to final destination.

On the basis of exploration and development work performed thus far, here are the answers to some of the vital questions bearing on San Manuel's future:

1. Water. No unusual problems are anticipated in this respect. The No. 1 shaft is making about 900 gpm., and the No. 2 about 850 gpm. Drainage operations thus far have demonstrated that the water table can be lowered without excessive pumping. In fact there has already been a measurable drop in the water table. Observations of water-table changes in drill holes show that areas drained assume the shape of an inverted cone apexing at the bottom of the shaft containing the pump installations.

2. Caveability of the ore. Development workings in the orebody at the No. 2 shaft show definitely that the ore will cave. All drifts and openings have to be timbered soon after each blast. Fragmentation of ore due to blasting is very good, and virtually no boulders are in evidence in the dumps and ore piles around the No. 2 shaft. The porphyry orebody was penetrated by the No. 2 shaft about 705 ft. below the collar, and the quartz-monzonite zone of the orebody is estimated to start about 1,600 ft. below the collar.

3. Grade of ore. Assays of bulk samples of ore taken from the No. 2 shaft indicate that the copper content is somewhat higher than indicated by churn drilling. This was not unexpected, however, because the use of bentonite in churn drilling generally causes some dilution. (Total sulphide ore reserves reported in E&MJ, July, 1949, were 339,284,920 tons averaging 0.789% Cu.) The recoverable gold and silver content of the ore is sufficiently high to warrant smelter credits for these metals, and the molybdenum content is higher than anticipated.

4. Metallurgy. Tests performed on bulk samples of the sulphide ore indicate that the ore will respond exceptionally well to standard milling and concentration methods, and yield a good recovery.

In addition to the shaft installations mentioned previously, the present surface plant includes the following: a modern office and engineering building; a 3,000-kw. power plant equipped with three Cooper-Bessemer diesel-electric generators burning both diesel oil and natural gas; a 1,950 cfm. and 1,675-cfm. air compressor, both installed in the power plant building; machine shop; electric shop; timber-framing shop; drill and bit shop; and a change house.

Utah (*Continued*)

Park Utah side if the Crescent fissure. Both companies have set aside working ground under this fissure 600 ft. below the old Alliance Tunnel level.

★The Atomic Energy Commission has announced plans to place **eight to ten diamond drilling rigs** in the region 11 miles southwest of Blanding, early in 1951. The program, a part of the Commission's intensified search for ore in new sectors of the plateau region, is expected to call for a minimum of 60,000 and a maximum of 110,000 ft. of drilling.

★**Reports of Utah mill and smelter production** for October reflected the boosted national demand for non-ferrous metals. The month's output included: copper, 21,713 tons; lead, 4,560; zinc, 2,232; gold, 39,309 oz. and silver 703,400 oz. Figures for copper and gold represented a sharp boost over comparable 1949 figures.

★Construction work is well advanced on the **$1,400,000 cobalt refinery being built at Garfield,** for the Howe Sound Co. The project is a portion of a broad Idaho-Utah program that will provide some 2 million lb. of refined cobalt annually by 1952, thereby partiallly reducing the cobalt shortage recently termed critical by federal officials. Our present cobalt supplies come, in the main, from the Belgian Congo.

The Howe Sound Co. program includes intensive production of the valuable ore at properties of the subsidiary Calera Mining Co. at the Blackbird Mining District some 30 mi. from Salmon, Idaho. At that location, a 600-ton flotation mill is in the process of installation. Ore in the 7,000-ft. Blackbird mine, first known to include cobalt as far back as 1893, is of fairly low grade, but the development of proper concentrating methods reportedly held up production.

Concentrates, expected to run 14 lb. of cobalt per ton, will be trucked to the Union Pacific Railroad at Mackay, Idaho, in part over 30 miles of new road built for the purpose under the Howe Sound Co. program.

At Garfield, near Salt Lake City, grading is already under way for two rail spurs, and a two-mile water line is also under construction. The refinery site is a 72-acre tract, on which a 100 x 29-ft. refinery structure, a 32 x 96-ft. laboratory and 30 x 40-ft office structure are being erected by the Utah Construction Co.

According to present plans the Blackbird ore will be broken down into a copper concentrate and a cobalt pyrite concentrate. The pyrite is calcinated with the cobalt floated out and leached in acids. Electrolysis is to be used to obtain a cobalt deposit.

The Garfield refinery construction is expected to be completed in the fall of 1951, with the mining development and milling setup expected to be operative at about the same time.

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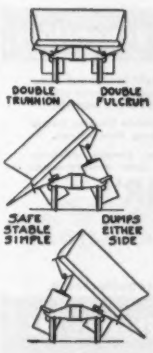

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WASHINGTON

★**Anaconda Copper Mining Co. negotiated to purchase the Bonanza lead** mine at Bossburg for $2 million. During 1950 the mine employed about 65 men and had a daily production of approximately 100 tons of ore, which averaged from 22 to 24% lead with about 4 oz. of silver per ton. The mill has recently been equipped with about $100,000 worth of new machinery.

★Pend Oreille Mines & Metals Co. gave their employees a **cost-of-living increase** of 10c. an hour retrocative to Nov. 1, according to W. L. Zeigler, manager.

★**Production of lead** in the state was listed by the U. S. Bureau of Mines as 790 tons in September compared with 950 tons in August. Zinc production, also down, was 1,190 tons in September, compared with 1,440 tons the previous month.

★According to Loren G. Brown, president of **Columbia Gypsum Products,** Inc., the company's plant near Velox is producing agriculture gypsum as a soil conditioner a direct fertilizer. The calcining plant under construction will have a hardwall plaster capacity of 100 tons a day.

★Mines Management Inc. reports **640,000 tons of indicated ore** at its zinc-lead Iroquois mine in Stevens County, having an average grade of 3.02% zinc and 0.88% lead.

★Gold Bond Mining Co. with property west of Wenatchee in the Blewett mining district, recently **completed a 2,700-ft. aerial tramway** to provide cheaper transportation to the mill and to permit use of the upper road for access to tunnels. They plan to build a 500-ton daily capacity mill.

★Kaiser Aluminum & Chemical Corp. **produced its billionth pound of aluminum** at its big Mead reduction plant on Nov. 18. According to Theodore Schmidt, public relations director, the three Kaiser aluminum plants in the state are breaking production records.

★**Work will continue through the winter** at the Jim Creek lead-zinc-silver mine six miles northeast of Ione, according to Val Y. Preston, Spokane, a partner since July with George and Henry Rushmier.

★Operations of **Slate Creek Mining** Co. at its gold property consisting of 42 claims in Whatcom County will be stepped up in the spring, according to Harry P. Kramer, president. Development work has been under way on the first and second levels, with samples assaying as high as $80 per ton. Ore reserves are estimated for at least three years at 100-ton daily capacity.

★The Lead Trust mine, near Leadpoint, shipped a **truckload of high-grade development ore** to the Trail smelter in October. F. J. Cardinal, leaser, started development work three

years ago and said he is planning to build a small mill at the mine.

★Robert H. Stebbins, geologist for the State Division of Mines and Geology, reported a significant increase in mining in the state during 1950. Metallic properties under development increased by 15 and the number of shippers by five.

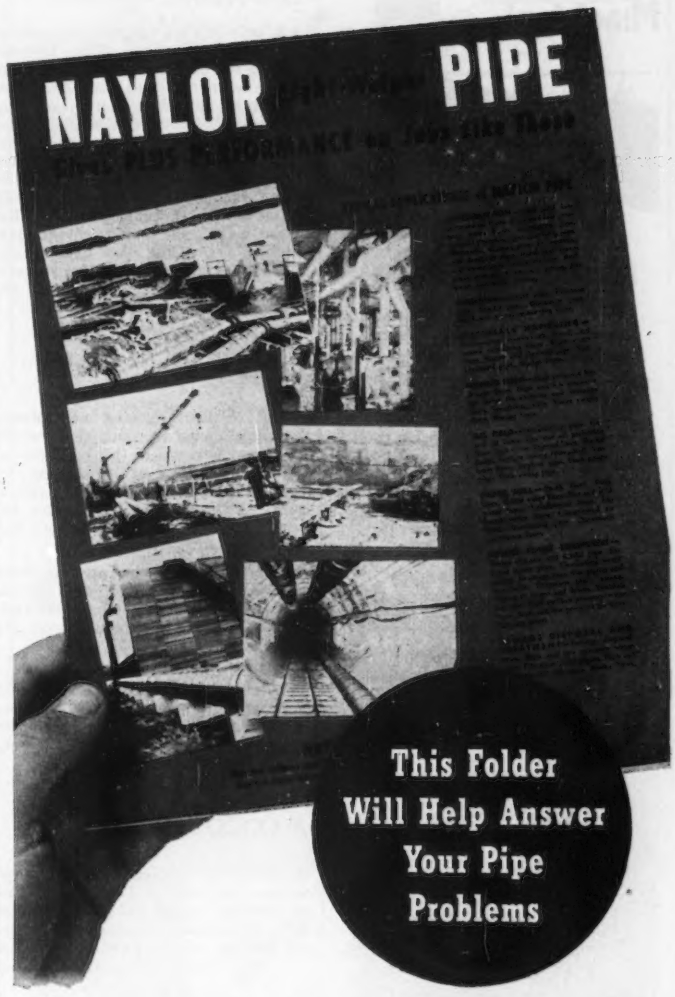
★A wage dispute which closed the Tacoma smelter early in November was settled Nov. 26, when an agreement was signed granting the workers a 15c. hourly wage boost. The Mine, Mill & Smelter Workers Union (Ind.) had originally asked for 25½c. and American Smelting & Refining Co. had offered a 10c. increase, the same as previously agreed to at all other operations of the company where the Mine-Mill Union has bargaining rights. However, the Federal Mediation and Conciliation Service summoned both sides to Washington, D. C., and recommended the 15c. increase which brought the smelter base common labor rate to $1.50 an hour.

IN LATIN AMERICA

BOLIVIA

★Following three-way conversations among the Bolivian Government, the country's major tin producers, and representatives of the United States Government, a new decree was issued on Oct. 30 that considerably relieved the burden placed on mineral producers under the old decree. Under the new decree 18% of the gross value of mineral exports will be retained in foreign currency by the mineral producer to cover operating charges. The rest will be deposited with the Central Bank. The Bank will set aside 22% or 24% (depending on whether tin is selling above or below 90c. per lb.) of the gross value to the account of the exporter from which he can draw foreign currency to pay salaries, supplies, amortization, and profits. All the rest of the gross income must be sold to the Central Bank at the official rate of exchange, now 60 Bolivianos to the dollar. Patino, Hochschild, and Aramayo, the three big tin companies, have agreed in return to raise Bolivia's tin output to 32,000 metric tons of fine tin annually within two months, and to a rate of 35,000 tons in six months.

★Within the last 18 months, three lead smelters have been built and put into operation in Bolivia. They are at La Paz, Tupiza, and Cochabamba, respectively. Total capacity is about 8,000 tons per year, or about a third of the present production of concentrates.



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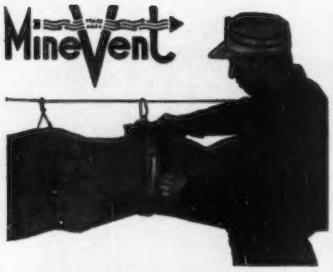

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Mr. H. Keller, General Manager of Bolivian Tin and Tungsten Mines Corp., uses McGRAW-HILL PRE-FILED MINING CATALOGS when he needs information on equipment necessary for the operation of five mines located in remote Huanni, Bolivia.

In a recent statement Mr. Keller said, "Your MINING CATALOGS is always useful as a reference for engineers located so far from home where direct contact with representatives of the different companies is difficult and at times impossible."

If PRE-FILED MINING CATALOGS is not available for buying reference at your mine, write to McGRAW-HILL CATALOG SERVICE, 330 West 42nd Street, New York 18, N.Y. There is no charge to qualified users.

Latin America (*Continued*)

★A new note was struck this year in the annual convention of the **Bolivian Federation of Mine Workers.** By contrast with previous meetings, this convention stressed themes of nonviolence, patriotism, discipline, and devotion to strictly bread-and-butter issues. A resolution was passed forbidding union officials to take active part in politics or to become candidates for the National Congress. Bolivian labor relations over the past two or three years have been unusually bloody and violent. The peaceful tone of the convention was all the more remarkable for that fact.

CHILE

★The National Mining and Metallurgical Council has published results of recent surveys in the Territory of Amapa. **Deposits of manganese** are reported running to 25,000,000 metric tons. A lead orebody carrying between 3,000,000 and 4,000,000 tons was also reported.

★**The Rio De Janeiro port administration** has begun work on facilities to handle, for export, up to 3,000,000 tons of iron ore or manganese ore per year.

★**The Brazilian Navy** has lent its support to a campaign to get Government support for new plans to develop Brazil's nickel reserves. This support would be through tax and tariff help as well as direct financial aid.

MEXICO

★Answering criticism from silver consumers that the Bank of Mexico had deliberately **raised the price of silver** as a money-making scheme, Lic. Carlos Novoa, director-general of the Bank, said that Mexico, as the world's leading silver producer, has a right to fix the price of that metal in defense of her own interests. He styled the accusations as absurd, and said that all the Bank had done was try to maintain a stable market for silver. Sr. Rodrigo Gomex, sub-director, pointed to the Bank's stock of silver (42,700,000 oz. on Oct. 21) as no more than enough to cover demand from Mexican and foreign mints. He said the Bank would continue to sell all the silver it could on the New York market.

★The Mexican Mining Chamber, through its president, Lic. Carlos Sanchez Mejorada, praised the Bank for its recent stand on silver, and expressed the gratitude of the mining industry for the Bank's silver management policy.

BRAZIL

★According to a speech made recently in the Chamber of Deputies by Senor Melej, Congressman and member of **the Paipote smelter** board of directors, it will take about $11,300,000 to get the smelter going. These funds would be distributed as follows: To finish the smelter, $2,200,000. To build up a stock of ores and concentrates, $5,000,000. For working capital, $900,000. To develop copper mines near the smelter, $3,200,000. The smelter should be ready to start by August, 1951.

★The Chilean mining associations are pushing a bill to have all the various taxes that must be paid by the small miner lumped into **one grand tax** that would be collected, and paid, by the ore buyer. This would simplify both payment for the small miner and collection for the Government, the associations believe.

★**Cia. Minera Delirio de Punitaqui** recently started up its new 80-ton copper-gold flotation mill.

IN CANADA

- Base Metal Boom in B. C.
- High Dividends for Canadian Metal Mines

QUEBEC

★With 1,000,000 tons of ore indicated above the 1,000-ft. horizon, **Bevcourt Gold mines** is considering plans for mill construction on its property in Louvicourt twp. Grade is estimated at approximately 0.25 oz. gold per ton. A large-scale production test has been in progress during recent months in which 50,000 tons of ore have been milled at the plant of Perron Gold Mines, adjoining. Results have been gratifying and have turned Bevcourt thoughts toward installation of its own mill.

★Surface drills are turning at the **Gaspe district property of Federal Lead and Zinc Co.,** the motivating funds having been supplied by East

Sullivan Mines and Sullivan Consolidated Gold Mines.

★Shaft-sinking is proceeding on schedule at the **Thetford area property of United Asbestos Corp.**, the half-way mark having been passed on the way toward 600 ft. Negotiations are concurrently in progress for the extensive funds which the company will need to bring it to production, possibly $2 million or more.

★The latest Noranda-district sleeper to awaken is the property of **Bazooka Gold Mines**, operational control having been acquired by Eldone Gold Mines. A three-compartment shaft will be sunk to 400 ft., the first level to be established at the 350-ft. horizon.

Eldona's own property, in the same area, has been leased to Harrison Drilling and Exploration Co. which will mine and mill the known gold-silver-zinc-copper ore on a basis under which Eldona receives one-third of the net profits. Operations were suspended there last summer when depth exploration proved disappointing.

★A new mining camp is indicated north of Steel in Barraute typ., where **a silver-zinc showing of possible importance** is being explored by Barvue Mines, Golden Manitou subsidiary. Discovered late in the fall, the new show started a staking rush that has spread over an area of three hundred sq. miles in three townships.

The find was first made on surface where modest values were secured across a width of 70 ft., with one 12-in. section averaging 35% zinc. Initial drilling has confirmed the find, though no dimensions or averages can yet be quoted.

Under its financing deal Golden Manitou will provide all development funds, receiving two-thirds of Barvue's stock and loaning such extra money as may be necessary.

ONTARIO

★Canada's first discovery of vermiculite, made this year at Stanleyville, near Perth, will be developed by Siscoe Gold Mines through its wholly-owned subsidiary Suzorite Co. of Ontario, Ltd. Suzorite already produces vermiculite products but, up till now, has imported the raw material from South Africa. Its plant is located at Cornwall on the St. Lawrence River.

★Good values have been secured by **Delhi (Temagami) Gold Mines** in the adit being driven to develop the indicated lead-silver orebody at its property in the Temagami Forest Reserve. The first several rounds returned values comparable to those had on surface where the vein was traced for 590 ft., with assays as high as 20% lead and 10 oz. of silver per ton across widths of 2 to 3 ft.

★Two operating companies, **Keylode Cobalt Silver Mines** and **Penn-Cobalt Silver Mines**, have been formed to ex-

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New Zinc Find in Quebec

SHAPING UP as the best North American base-metal find of the year, the Barvue prospect of Golden Manitou Mines Ltd. in Barraute township, northwestern Quebec, may well be one of the province's important zinc producers by 1952. Not only have the diamond drills hit ore in the first 10 holes, but they have already indicated 1½ million tons of ore running about 3½% zinc.

Objective of the drilling program, according to Andrew Robertson, general manager of the Golden Manitou and this prospect, is 10 million tons, (Geologists and engineers on the job estimate that another 20 holes might reach the objective) and mill construction will be started on the basis of that tonnage. Mr. Robertson stated that the management was thinking in terms of a 5,000-ton plant, with the orebody being mined as an open pit.

Mineralization is in a rhyolite breccia lying between two fault zones. The strike is approximately northwest, but due to folding the strike may bend westward. This however is a conjecture which remains to be proved by the diamond drill.

To date, vertical depth of the orebody is indicated to 500 ft. in drill holes which have been put down for 300 ft. along the strike. Four holes on a perpendicular section across the strike have indicated a highgrade zone of 8% zinc ore over a true width of 40 ft. On the basis of 3 to 3½% zinc as a mineable grade of ore, the true width of the deposit is about 170 ft.

Initial metallurgical studies undertaken at the Golden Manitou indicate that a 60% zinc concentrate can be made from the Barvue ore. Altogether, the net recoverable values at current metal prices would be in the neighborhood of $5.50 per ton.

Much credit for the discovery must go to W. W. Weber, of the Quebec Mines Dept., who mapped the geology of the area.

ONTARIO *(Continued)*

plore and develop properties owned by Silanco Mining and Refining Co., in the Cobalt area. The Keylode is in South Lorraine twp., 23 miles southeast of Cobalt while the Penn-Cobalt is within 2 miles of the town. Both properties are veterans of the old Cobalt days, and both companies are controlled and financed by Silanco and associated interests. Their formation reflects the success of Cobalt Lode Silver Mines, which brought its 100-ton mill into production in November.

★**Campbell Red Lake Mines** will pour gold worth somewhat more than $2 million in this its first full year of production. Output in the first ten months was $1,800,000 with recovery averaging about $16 against operating costs of approximately $8.45. Campbell's loan from the parent Dome Mines has been reduced from $2,345,000 to $1,745,000. Ore reserves at the end of 1950 will work out to slightly more than the 420,500 tons which were in sight last January. Grade will be about the same, around 0.44 oz. gold per ton.

★Well over 200 ft. of ore has been opened by **Paymaster Consolidated Mines** in the new section of its 4,075-ft. level. Full width will be somewhere between 25 and 50 ft., with grade somewhat below the 0.375 oz average secured in drifting. Full length of the Porcupine veteran's new orebody has not yet been determined.

★The productive days of **Little Long Lac's mine** appear to be numbered. This original producer in the gold camp of the same name is now on a salvage basis, decision having been reached not to invest any further capital in shaft-sinking. At least three years will be required for the clean up, and when the mine's last ore has been hoisted the company will probably have $1.5 million in hand as well as a first-class mining plant and a 325-ton mill.

★**Decision regarding mill construction may be reached early in 1951** by Ladulama Gold Mines, which has been getting development results quite up to expectations on its three new levels. The mine now has five levels to a depth of 750 ft., and another two may be opened up next year, but it is expected that enough ore will be in sight within a few months to make production plans feasible.

MANITOBA

★**Sherritt Gordon Mines Ltd.** in its report for the third quarter of 1950 shows an operating profit of $569,315. Production has been at a slightly lower rate than that of the previous quarter.

Expenditures during the year on the Lynn Lake operation have totalled $885,746. Results of underground development work during the period have been very satisfactory. The pilot mill has been in continuous operation handling ore from the "A," "B" and "C" ore bodies. Concentrate for shipment to Ottawa has been stockpiled throughout the year.

An agreement has been negotiated with Chemical Construction Corp. under which Sherritt Gordon acquires the Canadian rights to certain of its processes for the treatment of sulphide or arsenical ores and concentrates. In return Chemical Construction Corp. has been given the foreign rights to the Sherritt ammonia leaching process.

★A parallel orebody at **Nor-Acme Gold Mines** is indicated by diamond drilling being carried out by Howe Sound Exploration Co. Production at present holds at 2,000 tons a day. The mine had 2,639,000 tons in reserve at the beginning of the year, in the main orebody.

BRITISH COLUMBIA

★**What promises to be one of the biggest base metal booms** in the history of British Columbia is under way, with the search for and production of war-short metals likely to boost the province's total mineral output for the present year beyond the $133,012,968 value of last year.

The rising boom, as base metal prices surge upward, is reported by B. C. & Yukon Chamber of Mines officials at Vancouver, who state at least 12 new mills are under construction or planned, while others already in operation.

Retallack Mines, Kootenay Belle subsidiary at Whitewater has a new sink-float plant in operation and Highland Bell at Beaverdell has its new 50-ton mill in operation. The former Hedley Mascot mill soon will be ready at the Giant Mascot mine, formerly Silver Giant, Spillimachene, and Violamac mill is also due for full operation soon. Van Roi, near Silverton, expects to have a mill by spring, while Emerald Glacier, in Tweedsmuir Park area, is getting the former Kenville Gold Miles mill, and the CM&S-backed Bluebell mine, at Riondel in the Kootenay, plans to have a 500-ton plant within a year.

Western Uranium Cobalt, near New Hazelton, with an eye on copper deposits, is planning a 150-ton mill, and Estella Mines, near Cranbrook, is reopening for the first time in 20 years, with plans for a 150-200-ton mill. Yale Lead & Zinc, Ainsworth, is installing a 250-sink-float plant and 75-ton concentrator. Doreen Gold Mines, west of Hazelton, is installing a mill; Cork-Province, subsidiary of Base Metals Mining Corp. at Kaslo, will soon have a mill, and another Base Metals subsidiary, Vancouver Island Base Metals, is preparing for production. Santiago Mines, Ltd., has initiated plans for a 1,000-hp. hydro development and a 75-ton mill, and Reeves-MacDonald, south of Salmo, has output over the 1,000-ton daily mark with its two new units.

Meanwhile, newly-formed Sil-Van Consolidated is swinging into plans for development, with a possible mill in sight, near Smithers, while in the same area Cronin Babine and Glacier Gulch are undertaking development programs. American Standard and

National Exploration are new developments near Silver Standard operations in New Hazelton area. Silver Tip and Big Four Silver are advancing programs development in the Portland Canal area, where Silbak-Premier is undertaking to mine and mill Indian Mines ore, using a new tramline to transport ore to the Silbak mill.

★On the opposite side of the ledger is a picture of rising wages. About 1,400 employees of B. C.'s **two largest copper mining firms** recently accepted a 12.5c.-an-hour-wage boost. Under a new contract won by International Union of Mine, Mill and Smelter Workers, workers at Britannia Mining & Smelting Co. and Granby Consolidated's Copper Mountain operations get an extra $1 a day on the present basic scale of $9.50.

★**Mine-Mill** workers at **Silbak Premier mine** are seeking a 25c.-an-hour wage booost, 40-hour week and triple pay for work on statutory holidays, union shop and other concessions. A Labor Board conciliation officer has been named to seek a settlement of the dispute.

★**Consolidated Mining & Smelting Co. of Canada,** has initiated a program to extract 2 million tons of ore at the Sullivan mine. Contract for removal of some 200,000 cu. yd. of gravel and 2,200,000 tons of rock from the area to be mined has been awarded to Northern Construction Co. and J. W. Stewart, Ltd., of Vancouver. About one year will be required for stripping before mining can start. Ore will be dropped down a 500-ft. raise from one corner of the pit to the 3,900-ft. level where it will be transported in cars to the new underground crushing plant.

★Gold Drop Mines, Ltd., a Montreal concern, plans **development work** next spring on an upcoast property showing high metal returns. Subject to financing plans, the company hopes to push forward extension of its present 600-ft. tunnel on claims it holds in the Marmot River area.

★A new B. C. mining company, **Sil-Van Consolidated Mining & Smelting Co., Ltd.,** plans immediate start on development of 71 silver-lead-zinc claims on the southern slope of Hudson's Bay Mountains, about 12 miles from Smithers.

★**Silver Standard Mines, Ltd.,** reports that for the third quarter of 1950, ore averaging $92.21 per ton brought an operating profit of $238,091.

★Tunnels on two veins at **American Standard Mines, Ltd.** property, near Silver Standard, are being started. A camp has been installed and arrangements made for winter development.

★Two new ore masses have been found by underground drilling at **Violamac Mines, Ltd.,** property at Sandom. The orebodies were discovered just below track level in Five East drift, returning high values in lead.

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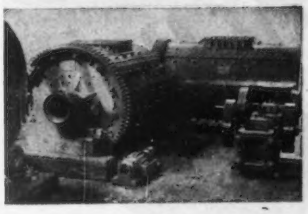

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IN THE PHILIPPINES

★**Gold production at the Benguet-Balatoc** mines continues to increase. October output was valued at P1,035,599 with gold at the statutory price of P70 ($35) per oz. from milling 69,924 tons at the central mill during the month. This compares with production of P856,228 from milling 67,324 tons in September. Gold recovery per ton milled was also higher in October at P14.80 compared with P12.72 in September. The actual value in pesos received by Benguet for its bullion was much in excess of the statutory price, as 75% of its production is sold on the open market in Manila where over P120 per oz. has currently been paid. The government requires that 25% shall be turned over to the Central Bank at the statutory price. The milling rate, now 2,250 tons per day, will be expanded to 2,500 tons before the end of the year.

★**Mindanao Mother Lode** reported P345,674 recovered in October from milling 10,900 tons of gold ore, with some copper values. This was lower than the record September production of P415,566 from 9,900 tons milled, averaging P42 ($21) per ton. The 1,025-ft. level has cut the Tabon vein with average values fully as high as on the 925-ft. level. The company will collect a final war damage claim of P800,000 in addition to that already received.

★**Atok-Big Wedge** milled 14,290 tons in October, recovering P304,662 in gold, an average of P21.30 per ton. Recent showings at depth have had considerable promise. A new vein parallel to the Keystone has been cut on the 600-ft. level, with good gold values.

★**Surigao Consolidated** reported 10,450 tons milled in October, valued at P267,100. High-grade ore has been encountered on the 500-ft. level and gold output has been increasing.

★**Lepanto's production** in October was valued at P1,035,600 from milling 29,019 tons, which gives the mine the distinction of being the most important dollar-producer in the Philippine Islands. All concentrates are exported to the United States.

★**Total gold production** of the Philippines for the first nine months of 1950 exceeds $10,000,000 in value at the statutory price.

★**Consolidated Mines** shipped 23,500 tons of refractory grade chromite ore in October. Most of the shipments were consigned to buyers on the Atlantic Seaboard, but 3,900 tons was purchased by the Kaiser Chemical and Aluminum Company of California. Shipments could have been larger if shipping space had been available. Demand for the ore has been excellent.

★Construction of the new concentrating mill for **Acoje** is proceeding satisfactorily. The mill will have a capacity of 300-400 tons per day of chromite ore. A high grade concentrate will be made.

★A new contract has been signed for shipment of 550,000 tons of Philippine iron ore to Japan, involving about $3,600,000. Ore will come chiefly from **Philippine Iron Mines** at Larap near Parocale.

IN AUSTRALIA

NEW SOUTH WALES

★Lead supplied to Australian industry by **the Broken Hill companies** should prove more than ample for all requirements if scrap lead were recirculated to eke out supplies of virgin lead, according to M. H. Baillieu, chairman of **North Broken Hill Ltd.** Both in the U. S. and in the U. K. more than 40% of industrial lead demand was satisfied by junk yards, but in Australia the price of scrap was not sufficiently high to make its collection and treatment attractive. He estimated that Australia used 25,000 tons more virgin lead a year than it would if *per capita* consumption was about the same as in the U. S. and Canada. At present prices, that represented a direct or indirect loss of about £3,600,000 ($8,100,000) annually. As similar conditions applied to zinc, the total contribution which the Broken Hill mining companies and the Electrolytic Zinc Co. were making to the economy of Australia by selling the metals at fixed domestic prices instead of at world prices as at the rate of £10,000,000 ($22,400,000) a year.

Mr. Baillieu does not foresee a significant rise in world production and he also believes that the present rate of consumption will be maintained for some years.

Turning to **North Broken Hill** in his annual report to stockholders, he disclosed that developments at the northern end of the field amounted almost to the establishment of a new mine. The most important development at the mine was the confirmation of the orebodies south of the De Bavay fault. . Last year, the company appropriated £750,000 for new plant and for mine development. Tonnage mined

last year was slightly better than in 1948-49, due to more mechanization.

★**Lead export from Broken Hill Associated Smelters,** Port Pirie, was 77% of total Australian production last year. Of that amount, 82% was sold to Britain, 7% to the U. S. and 5% to India. Shipments to India had greatly increased over the previous year, suggesting that a relatively important market is shaping up in that country, Mr. Baillieu noted.

QUEENSLAND

★**Kingston (Open Cut) Gold Mines Ltd.** expects to commence treatment next March. By mechanization of ore carrying and the use of gravity in feeding ore through the treatment plant the company plans to keep costs down and throughput up. Ore blasted off the 80-ft. wall of the open cut will be bulldozed to a crusher in the floor of the cut. Crushed ore will then be delivered through a chute to a conveyor belt which runs through a shaft, now being cut, up to an ore bin on the brow of the hill overlooking the plant. From the 2,000-ton ore bin, material will be fed by gravity through the plant, only one pumping operation being necessary. Slimes and residues run down the hill into a small creek which the company is damming to provide mine water supply. This dam closes the treatment circuit and so provides automatically for the trapping of small quantities of gold left in the residues. The company plans in terms of an initial throughput of 200 tons a day.

★**Gold production in Queensland** for the first eight months of 1950 was 57,970 oz., an increase of 6,509 oz. over the same period last year. Most of the gold came from Mount Morgan's copper workings.

FIJI

★The 1949-50 reports of **Emperor Gold Mining Co., Ltd.** and **Loloma (Fiji) Gold Mines, N. L.,** disclosed higher profits in spite of lower throughputs and yields and rising costs, reflecting the general operating picture in the Australasian area since devaluation.

Emperor's profit was £161,752 (Australian) compared with £76,202 in 1948-49 and £56,637 in 1947-48. In 1949-50, 133,089 tons were milled for 52,928 oz., compared with 139,588 tons and 59,241 oz. in the preceding year. Operating costs rose from 593.5 pence (Fijian) per ton to 633.6 pence, reflecting higher wages, power costs and general increases in practically all mine requirements.

Positive ore reserves at June 30 were estimated at 985,000 tons of 7.9 dwt. average grade—against 1,025,000 tons a year earlier—and probable ore at 150,000 tons of 7.2 dwt., compared with 175,000 tons at June 30, 1949.

Loloma's accounts showed a profit of £142,850 (Australian), against £128,083 in 1948-49 and £88,939 in 1947-48. A portion of the profit came from Great Boulder, in Western Australia, one of the Australian properties in which Loloma has invested past profits to escape payment of the heavy war-time tax on transfers to Australia which has not yet been repealed.

Treatment of 22,496 tons (20,353 tons in 1948-49) yielded 21,381 oz. of gold (29,736 oz.) and 6,537 oz. of silver (9,577 oz.) Head value declined from 30.07 dwt. to 21.56 dwt. Measured ore reserves remained unchanged at 48,000 tons of 20 dwt. average assay. Probable ore reserves declined by 5,000 tons to 20,000 tons of 10 dwt.

WESTERN AUSTRALIA

★The claim that Western Australia has what may prove to be one of the **world's largest chromite deposits** was made in the budget debate in the Federal House of Representatives by W. L. Graydon, member for Swan, W. A.

"Millions of tons of the ore are lying waiting to be mined at Coobina, 255 miles north of Meekatharra, on the Meekatharra-Marble Bar road," he asserted.

"It is a golden opportunity for Australia to earn millions of American dollars and at the same time fill her own requirements. It seems unbelievable that this deposit has never been developed."

VICTORIA

★The state's premier, Mr. McDonald, has promised to assist two gold-mining companies which had asked for a grant of £40,000 ($90,000) toward the cost of installing electric power lines to the mines. The mines are **Morning Star, at Wood's Point,** and **A-1 Consolidated, at Gaffney's Creek.** G. Lindesay Clark, managing director of Gold Mines of Australia, parent company of Morning Star, said that the two mines needed the cheaper power that would become available if the state power line is extended. They could not continue deep mining for gold as fuel costs to provide their own power had been rising at such a rate that there were no profits in deep operations.

IN EUROPE

WEST GERMANY

★Private contracts, looking to the sale of 100,000 tons of **aluminum to the United States,** have been held up indefinitely by production stoppages due to a lack of electric power. The three aluminum plants now operating could supply only 85,000 tons annually, not enough for even the domestic demand. Germany is using increased amounts of aluminum to replace the almost unobtainable copper formerly used. Unofficial sources say that far from exporting aluminum, Germany will need to import about 8,000 tons annually.

CZECHOSLOVAKIA

★The Czech Ministry of Foreign Trade announced recently that **trade agreements with Russia** call for greatly increased shipments from Russia of copper, iron ore, aluminum, and other raw materials for a rapid expansion of Czech heavy industry. It was stated that annual deliveries of iron ore over the next five years would average 2½ times greater than the annual average for the past three years. Aluminum shipments are to be trebled, and those of copper quadrupled. In return Russia will buy the products of Czech heavy industry at a rate greater than the orders the Czechs once got from the rest of the world together. Russian technical assistance is to be provided to help expand the Czech manufacturing capacity.

FINLAND

★**New nickel field** at Ulfsby, near Björneborg, may prove richer even than the Petsamo field which the Russians annexed. Reports indicate that it is certainly one of the most promising ore fields found in Finland. Discovery was made two years ago. Ore from the center of the field contains 1.5% Ni and 1% Cu, besides small quantities of gold, platinum, and other rare metals.

★**Magnesite deposit in Finnish Lapland,** near Enare lake, is claimed to be the largest in Europe, with millions of tons of 90% magnesite. Prospectors' reports indicate that the deposit is sufficient to cover all European requirements. (Magnesite is also found in Swedish Lapland, but is so difficult of access that ore samples have had to be flown from the field.)

★Two hundred tons of copper ore a day are being extracted at the **new mine at Aijala,** near Koski, S. Finland, by Outokumpu O/Y. At least a million tons of ore can still be mined.

IN AFRICA

★**South African Minerals Corporation** has found a major manganese orebody in Soxthwest Africa. The field lies about 100 miles northeast of Okahandja. Reports say that 110,000 tons of 50% ore has already been proved, with another 618,000 tons probable. Cost of production and all charges, on a basis of f.o.b Walvis Bay, is estimated at 71s. 6d. per long ton. High-grade ore is worth about 220s. per long ton, f.o.b Walvis Bay. Preliminary reports suggest mining 70,000 tons the first year, 120,000 tons the second, and a higher rate thereafter.

★**All South Africa's manganese output** from January through August, 1950, totaled 567,049 long tons. Chrome output was 350,298 tons. Chrome production in Southern Rhodesia in that period was 231,287 tons.

★**Egypt wishes to encourage investment** of foreign capital in the country's mines, and to that end, special treatment is being given a new bill on mines and quarries to encourage prospecting.

★**The Moroccan Phosphates Office** plans to increase production to 4,000,000 tons by 1952. This means spending about 5,000,000,000 francs, at least 2,000,000,800 of which would go for new equipment from abroad.

The Gold Tide Ebbs

(*Continued from page* 87)

September 30, when the reserves were increasing by $1,331,000,000, the ECA was putting almost as much, $1,146,000,000, into Britain's economy.

Commenting on the relationship of the ERP to the growth of the U. K.'s reserves, *The Economist* (London) recently observed:

"Every dollar that the American Government gives away now represents one less dollar's worth of purchasing power in the pockets of the American people.

"It is almost impossible to discern which is permanent and impermanent in the factors that have contributed to the recovery of Britain's gold and dollar reserve. The suggestion that America should go on helping Britain in order still further to raise the level of the gold and dollar reserve is one which might carry greater power of conviction in the United States if there were a clear indication that Britain would match each rise in its reserves by some relaxation in the discriminatory application of its import controls. Despite the doubling of the reserves since devaluation, there has so far been no such relaxation."

It is this situation which led to the opening in November of Anglo-American discussions looking toward the suspension of ECA aid to Britain. It was decided at last to suspend ECA aid to Britain as of Jan. 1, 1951, a year ahead of schedule. This should slow down the outflow of U. S. gold.

Gold Freed Again?—In sum, owing to the effects of the 1949 currency devaluations abroad, the diversion of foreign purchases from the U. S. A. to other countries, the resumption of the American industrial boom in 1949 and early 1950, and the defense measures set in motion by the Korean war, foreign countries have been enabled to acquire gold and dollars in volume.

These developments have occurred at a time when the outside world has continued, moreover, to receive substantial dollar gifts and loans from the ECA, the Export-Import bank, the World Bank, etc. Whether this trend will continue or be reversed depends upon many unpredictable factors. But while it lasts, the flow of gold from the U. S. to foreign ownership will tend to strengthen confidence in the foreign currencies concerned.

From the gold producers' standpoint, a strictly one-way flow of gold toward the U. S. is not a desirable phenomenon. From the same standpoint redistribution of gold is a good thing. If it goes far enough it could make possible the restoration of gold convertibility for currencies today strictly on a paper basis.

But we dare not predict that it will go far enough. To the extent that increased foreign gold reserves strengthen public confidence in the foreign currencies concerned, black and free markets in gold will tend to lose some of their attractions. On the other hand, confidence brought by increased gold and dollar reserves can readily be expunged by more serious developments in the military sphere.

Without attempting any predictions, suffice it to note that among governments gold is still the most esteemed material for use in monetary reserves, being regarded as a safer store of value than the almighty dollar.

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WHILE YOU **CONVEY**

Yes, weigh and record with the —MERRICK

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STANDARD ENGINEER'S REPORT

DATA

PRODUCT Chevron Starting Fluid

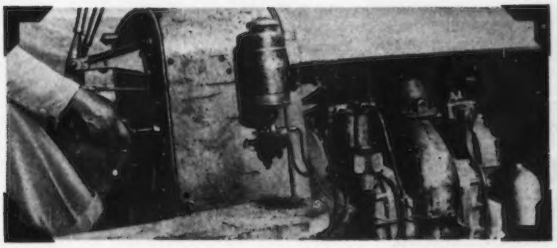
UNITS A. C. diesel engines HD-7 tractors

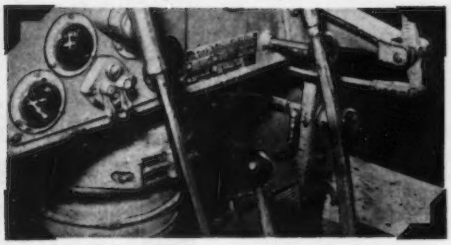
CONDITIONS 25° below zero weather—parked in open shed

EQUIPMENT Permanent primer with atomizers on blower

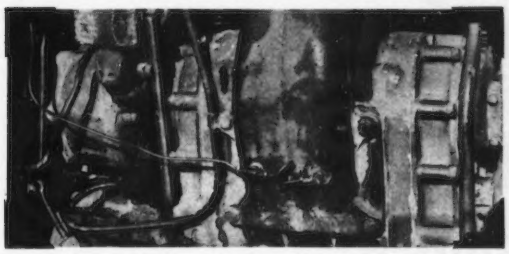
FIRM John W. Graves Heppner, Oregon

Engine starts on first turn at 25° below zero!



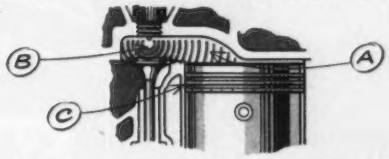


CHEVRON STARTING FLUID started this engine instantly every time during a severe Oregon winter, even when the tractor had been idle for several days in temperatures down to 25° below zero! John W. Graves, owner, says, "Power in the starter battery would last only for two or three revolutions of the engine, but Chevron Starting Fluid required only one turn to kick it off." With one or two strokes of the dash-mounted pump, fluid was forced from the storage tank (left center) into the "blower", before the starter button was pushed.



ATOMIZER NOZZLES, as shown on this diesel "blower", are also used to inject Chevron Starting Fluid into intake manifolds of gasoline engines. Complete primer equipment may be purchased from your fluid supplier. Chevron Starting Fluid comes in 3-pint cans, and capsules of two sizes—7CC's and 17CC's, packed 12 and 24 per can. It is approved by leading engine manufacturers.

How CHEVRON Starting Fluid Starts Gasoline and Diesel Engines Instantly



A. Atomizes in lowest temperatures and provides powerful, easily fired vapor in combustion chamber.

B. Pressure, or the weakest spark, fires mixture—turns engine and heats air for regular fuel mixture.

C. Contains lubricant and additives—prevent cylinder wear and ice formation in primer equipment.

HOT NEWS COLD ENGINES

FREE BOOKLET gives you more facts on Chevron Starting Fluid—shows where it should be applied in different type engines. Write or ask for it today.

CHEVRON STARTING FLUID

TRADEMARK REG. U.S. PAT. OFF

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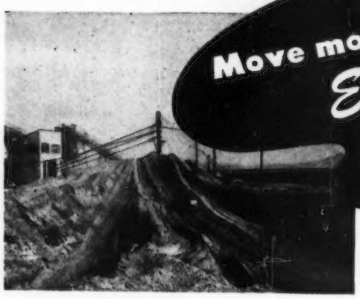

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SAUERMAN POWER SCRAPER

Picture shows a 4 cu. yd. Sauerman Power Scraper of the rapid-shifting type opening up a new pit where it handles the entire job of digging and hauling material to a screening plant processing 250 cu. yd. an hour.

Scraper Stockpiling Ore.

- When the job calls for digging, hauling and dumping loose materials at long range—it pays to install a Sauerman Power Scraper. Thousands of users testify that this is a sure way to cut costs—increase yardage—reduce labor problems.

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One quickly trained man handles the entire operation. First cost is low, so is the maintenance expense.

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Tax Tips for Small Mines

(*Continued from page* 71)

remainder can be carried forward to two years succeeding the taxable year. However, such net operating loss must first be carried back to the earlier of the two years preceding the taxable year, and to the extent not there utilized, may be applied against the year immediately preceding the taxable year. Any net operating loss not absorbed in either of the two years preceding the taxable year may be carried forward to the year immediately following the taxable year, and to the extent not absorbed, may be carried forward to the second year immediately following the taxable year. The net operating loss, as reflected by the income tax return, must be adjusted to a so-called "economic loss" to the taxpayer. These adjustments are set forth in detail in Sec. 122 of the Internal Revenue Code and Regulation 111, Sec. 29.122-1.

Insofar as the mining industry is concerned, the adjustment which must be made is to substitute depletion based on the unit-of-production method for depletion based on the percentage-of-income method. Unfortunately, this quite often results in no tax benefit whatsoever from a net operating loss. For example, if the taxpayer has a net operating loss of $30,000 as shown by the tax return for 1949, after all required adjustments are made, such loss must first be carried back to the year 1947. However, in event percentage depletion taken for the year 1947 exceeds cost depletion based on a unit-of-production method in an amount equal to $30,000 or more, the taxpayer can receive no tax benefit by carrying his net operating loss back to that year.

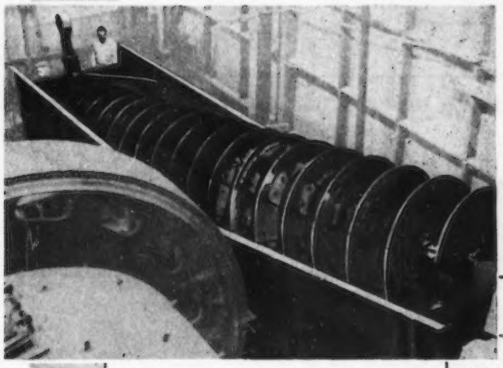
The law was amended under the 1950 act to provide that net operating losses, after providing for adjustments to arrive at an economic loss, may be carried back only to the year immediately preceding the taxable year, and to the extent not absorbed, may be carried forward for five years following the taxable year.

The computation of a so-called economic net operating loss is usually quite involved because of the adjustments which must be made, and the taxpayer should ordinarily secure the advice of a tax expert in making the determination.

Actual Operating Results Prove Efficiency of **WEMCO S-H CLASSIFIER**

Sharp separation at large capacity is a proven result at the Fredericktown Mill of National Lead Company, St. Louis Smelting and Refining Division. In handling a lead-copper sulfide ore, a WEMCO S-H Classifier is more than meeting requirements for close separation (desired grind—60% minus 200 mesh).

SHARP SEPARATION—From the table below note that this WEMCO S-H Classifier overflow analyzed 64.0% minus 200 mesh, showing a recovery of 88.1% of the minus 200 mesh material contained in the feed. Despite the high percentage of plus 65 mesh fraction in the classifier feed, only 4.5% was retained in the overflow. The sands, analyzing only 5.4% minus 200 mesh, contained 95.5% of the plus 65 mesh feed.



LARGE CAPACITY—Rate of overflow in this installation is 825 tons per 24 hours, exceptional capacity for a unit of this size (72" x 32' 0", Series 125, Straight Tank, Triple Pitch).

SCREEN ANALYSIS

WEMCO S-H Classifier at Fredericktown Mill, National Lead Company, St. Louis Smelting and Refining Division.

MESH	INDIVIDUAL PERCENTAGES RETAINED ON FEED	SAND (61.4% OF FEED)	OVERFLOW (38.6% OF FEED)	CUMULATIVE DISTRIBUTION OF FEED SIZES SAND	OVERFLOW
+65	51.2%	79.8%	6.0%	95.5%	4.5%
100	9.8%	8.9%	11.2%	89.2%	10.8%
150	5.8%	3.9%	8.9%	85.0%	15.0%
200	5.0%	2.0%	9.9%	80.7%	19.3%
-200	28.2%	5.4%	64.0%	11.9%	88.1%

THE S-H DESIGN

- **Greater capacity** of WEMCO S-H Classifiers is proven in operation—and explained by design. The S-H design permits use of a triple spiral for greater raking capacity with decreased pool agitation. In turn the greater capacity for sand removal creates a larger effective settling area. Both sand and overflow capacity equal that of the next larger size machine of other makes.
- **Modern design** of the WEMCO S-H Classifier gives superior operating results. The main shaft has a diameter up to 40% greater than other spiral classifiers. Flight arms are shorter and stronger, bearings are antifriction and fully protected, and modern hydraulic lifting action is provided for the spiral. Because the design is right, WEMCO S-H Classifiers do more work yet cost you less to run.

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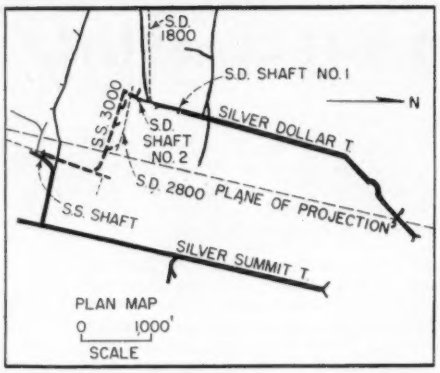
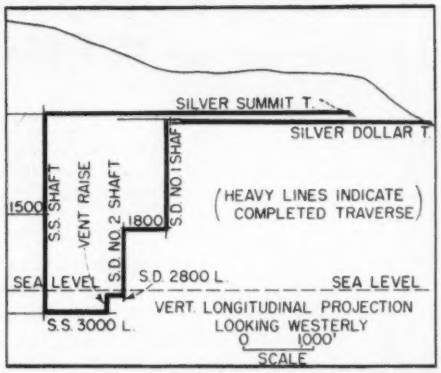


PLAN SHOWS horizontal traverse which totaled 14,872 ft. in length.



VERTICAL PROJECTION shows shaft plumbing which totaled 5,927 ft.

WALLACE CRANDALL

Underground Survey Connection Is "Right on the Nose"

GORDON PECK

LAST APRIL the Wallace Miner published an open letter praising the "remarkable accuracy" of an intricate survey completed at the Silver Summit-Silver Dollar properties. It was signed by E. G. Gnaedinger, a well-known mining engineer in the Coeur d'Alene district. Here are the details of the survey as set forth by Robert H. Sorenson, chief engineer and geologist of the Hecla Mining Co., Wallace, Idaho:

Approximately 20 years ago Polaris Mining Co. established a carefully-balanced triangulation system, which has since been used by Sunshine Mining Co. and other operators in the area. The Silver Summit tunnel was driven to the Polaris shaft and the tunnel survey was balanced to this system.

The present Silver Summit survey was run independently but checked against data from the triangulation system and former surveys. Closure was made via a vertical ventilation raise from Silver Summit's 3000 level to the adjacent Silver Dollar Mining Co.'s 2800 level (see illustrations). The raise target was a crosscut face where a diamond-drill station had been cut. This face was 11 ft. wide by 12 ft. high, and because of its large vertical component, elevations were carried by transit data from a triangulation station near the portal of the Silver Dollar tunnel. On the Silver Summit tunnel and 3000 levels, elevations were determined by "Y" level traverses.

Gordon Peck was chiefly responsible for the survey down the Silver Summit shaft to the 3000 level and from the Silver Summit shaft on the 3000 to the top of the ventilation raise. Wallace Crandall ran the traverses from the Silver Summit shaft to the Silver Dollar shaft via Silver Summit and Silver Dollar tunnels. Plumbing of the Silver Dollar shafts was done by Wallace Crandall, Gordon Pack, Philip Lindstrom and Philip Powers; and the Silver Summit shaft's were plumbed by Gordon Peck, Herbert Harper, Philip Linstrom and Lawrence Withim, all members of the engineering staff of Hecla.

Error of horizontal closure of the survey was 1/25208, the error in latitude being 8.20 ft., and in departure, 0.56 ft. The error in elevation closure was 0.65 ft. The following table shows horizontal and vertical distances traversed in order to make the connection:

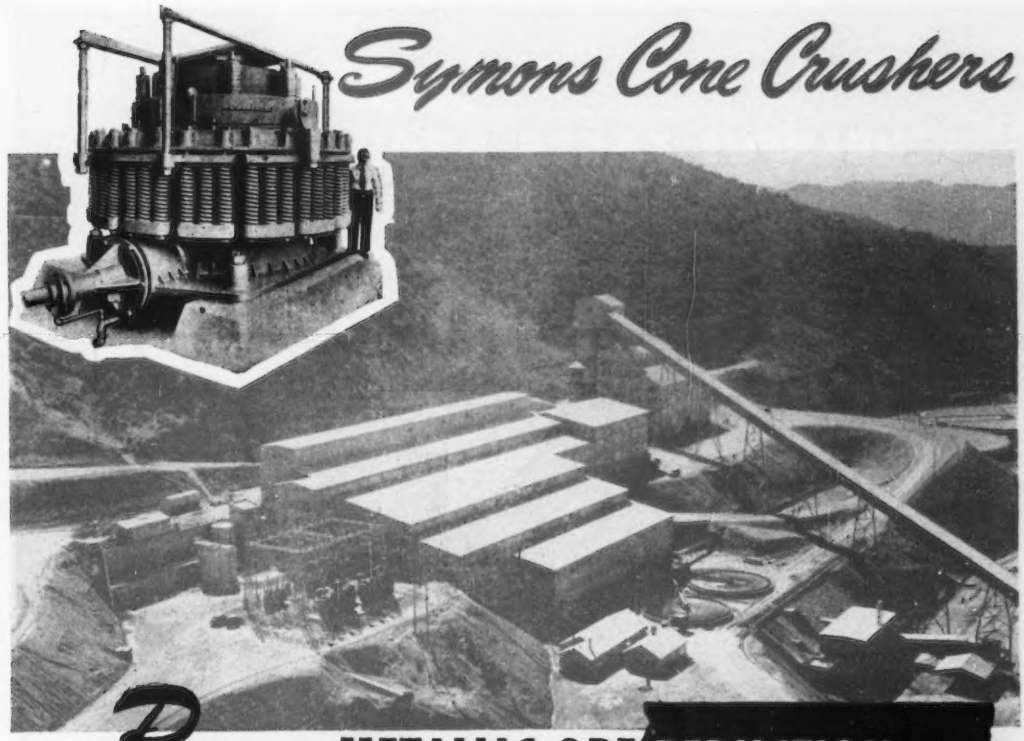
Total length of traverse involved was:	Ft.
Silver Summit Shaft to Portal	5,454
Silver Summit Portal to Silver Dollar Portal	2,014
Silver Dollar Portal to Shaft	4,286
Silver Dollar Shaft to Silver Dollar Winze	693
Silver Dollar Winze to face of Crosscut	280
Silver Summit Shaft to Ventilation Raise	2,145
Total horizontal traverse	14,872

Vertical shaft plumbing involved:	Ft.
Silver Summit Tunnel to 1500 Level	1,494
Silver Summit 1500 to 3000 Levels	1,508
Silver Dollar Tunnel to 1800 Level	1,673
Silver Dollar 1800 to 2800 Levels	1,030
Silver Dollar 2800 to Silver Summit 3000 Levels	222
Total length of shaft plumbing	5,927

Shafts were plumbed with two No. 20 steel wires carrying 50-lb. wing bobs suspended in oil. Wires were set to a known meridian on the upper level which was established on the lower level by the "wiggling in" technique. Six angular determinations were made, three by each of two engineers. Then the wires were moved to a different meridian, and six additional readings were made. The meridian used on the lower levels was the average as determined by 12 readings.

In traversing, angles were read in the normal position, the telescope was plunged and angles both vertical and horizontal were re-read. Survey procedures used in all the work were established by Charles H. Foreman, now retired, but formerly chief engineer for Hecla.

Symons Cone Crushers



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HELPFUL FACTS ABOUT flotation

IN THIS 16-PAGE BOOKLET

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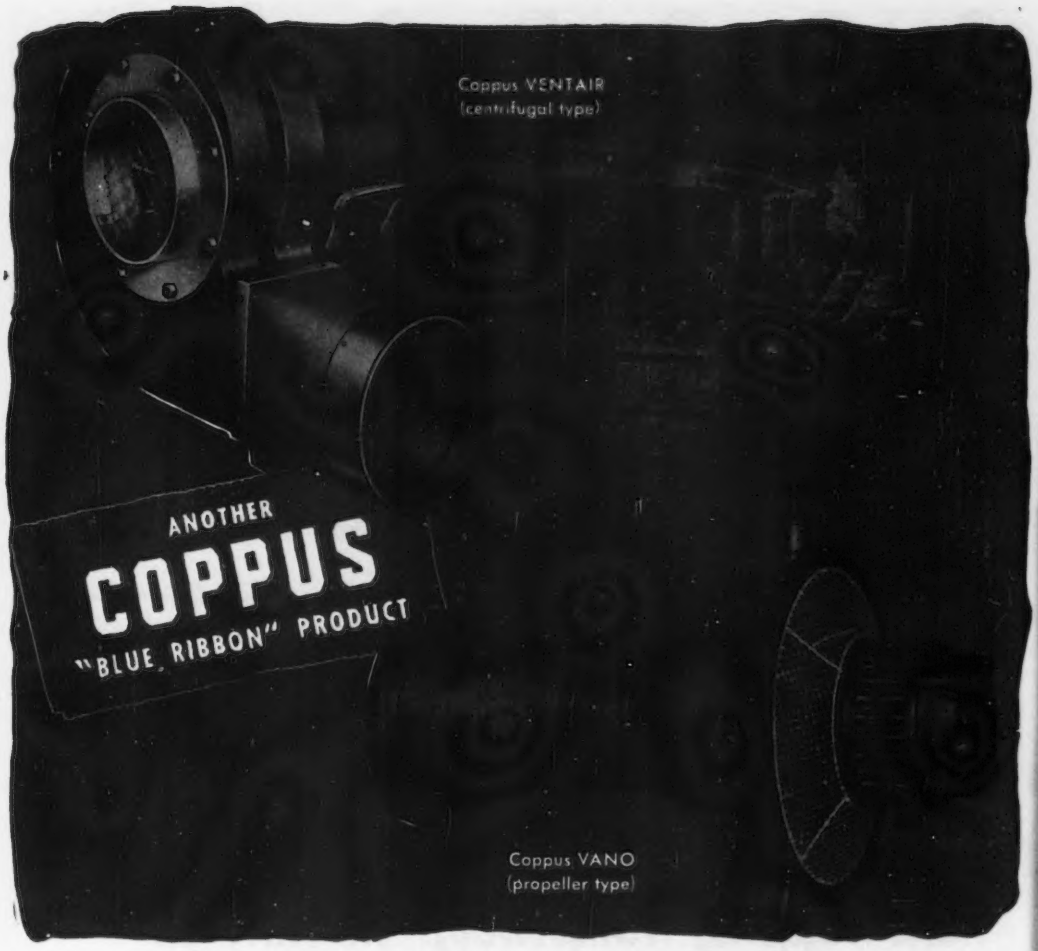

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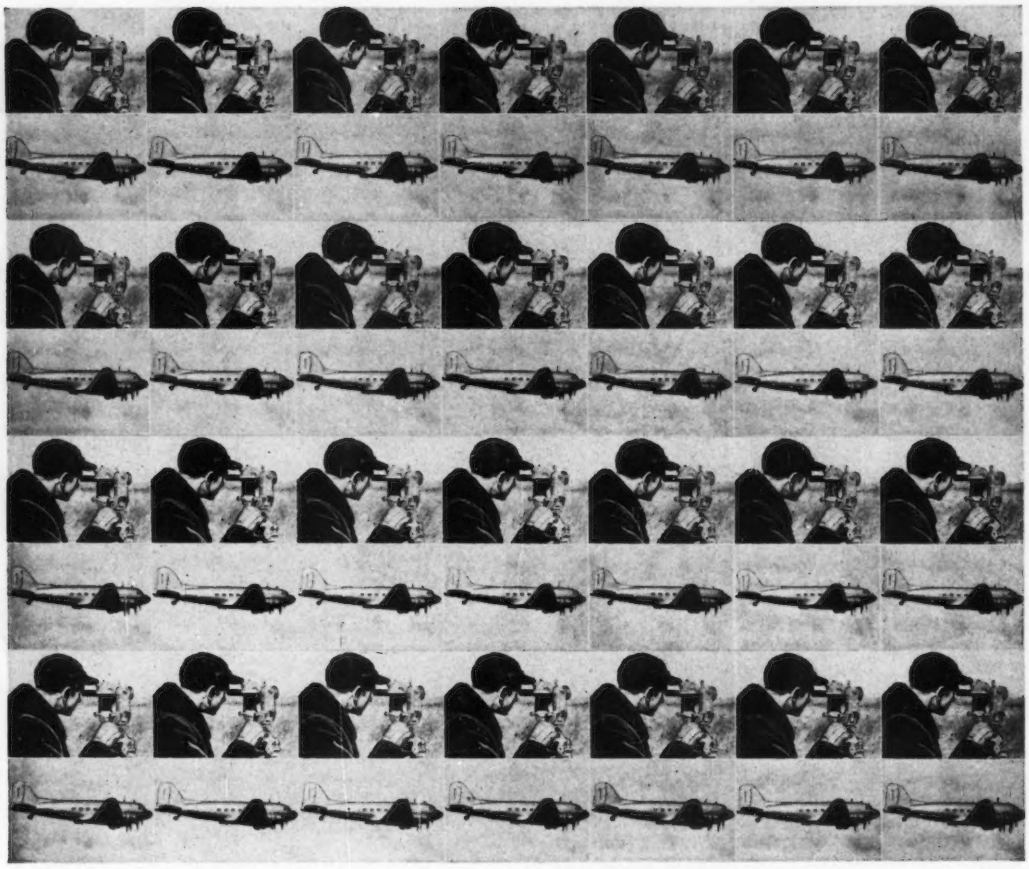

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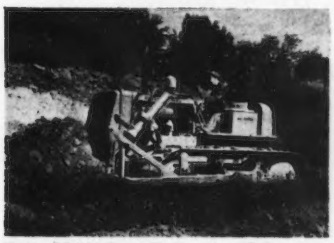
HD-15—27,500 lbs.—102 Drawbar H.P.—powered by a 6-cylinder GM Series 71 Diesel engine.



HD-9—18,500 lbs.—70 Drawbar H.P.—powered by a 4-cylinder GM Series 71 Diesel engine.

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That's why GM Diesel engines are chosen to power not only the "World's most modern line of crawler tractors"—but more than 500 different kinds of machinery built by 120 manufacturers.

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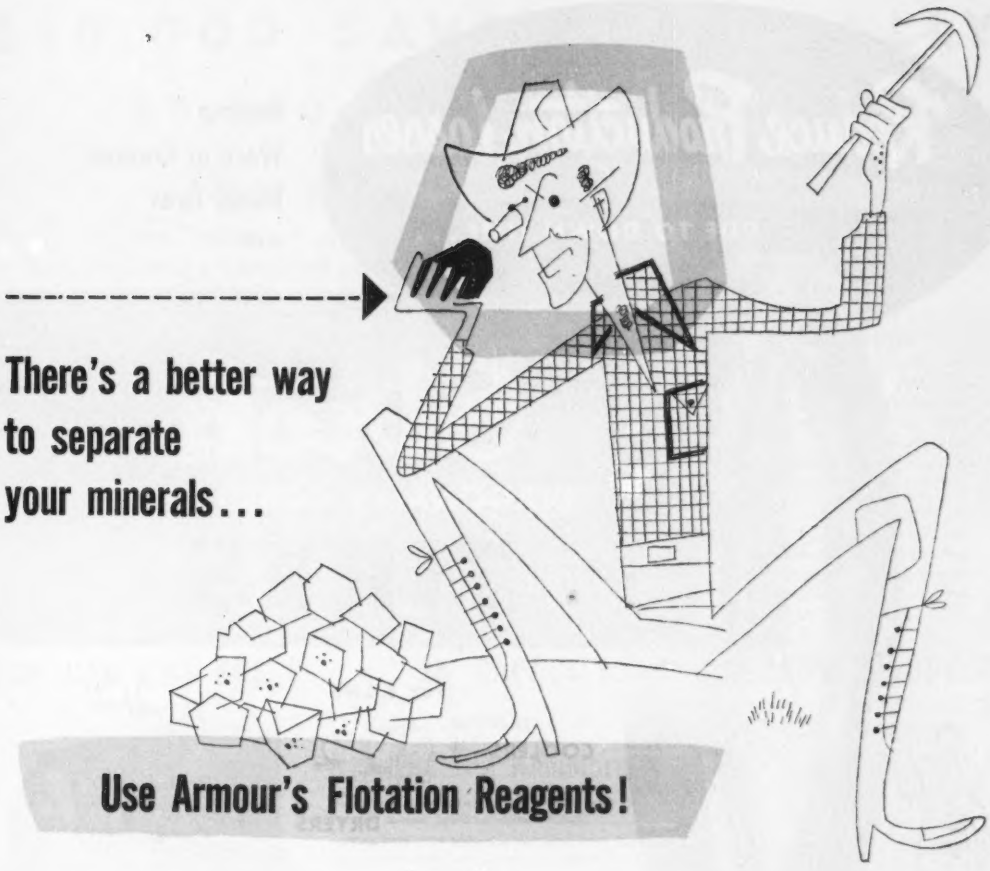

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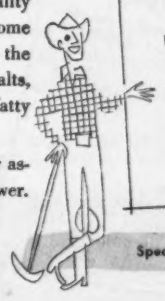
Ilmenite • Kaolinite • Mica
Phosphate • Potash • Salt
Silica • Spodumene
Syenite • Talc • Tin
Vermiculite



Specialists in Flotation Chemicals

ARMOUR *Chemical Division*

Armour and Company • 1355 W. 35th Street • Chicago 9, Illinois

Reduce Production Losses

DUE TO DOWN TIME . . .

Replace Worn or Cracked Metal Tires *with*

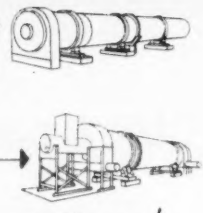
Stroh

DIAGONALLY CORED SPLIT TIRES

For KILNS →

COOLERS →

DRYERS →



Installed Complete in 36 Hours!

That's right . . . a Stroh diagonally cored split tire can be installed on kilns, coolers or dryers in as little as 36 hours, including reaming of holes and riveting. No need to tear out sections or disturb shell alignment. Mating surfaces are welded after installation—cannot loosen under action of load or heat. Welded joints roll smoothly in operation. Save time, money and effort . . . *specify Stroh* when replacing cracked or worn metal tires. A representative will gladly call at your request.

Write today for complete data.

CHECK THESE DEPENDABLE STROH PRODUCTS

For long-life, economical service, smooth operation of equipment . . . specify the following Stroh parts:

- ✓ GEARS
- ✓ PINIONS
- ✓ METAL TIRES
- ✓ TRUNNIONS
- ✓ SHEAVES
- ✓ SPROCKETS
- ✓ CRUSHER PARTS
- ✓ JAW PLATES
- ✓ RACKS AND PINIONS
- ✓ CRANE WHEELS

—for kilns, coolers, dryers, ball mills and similar processing equipment.

Stroh PROCESS STEEL CO.

PITTSBURGH 12, PENNA., U.S.A.

$10,000 SAVED ANNUALLY
ON A $12,600 INVESTMENT
$3,500 SAVED ANNUALLY
ON A $4,200 INVESTMENT
These are actual Case Histories

CASE HISTORY No. 1
With a New Bulldog Hammermill crushing 20" and under Fuller's Earth, 50% Moisture

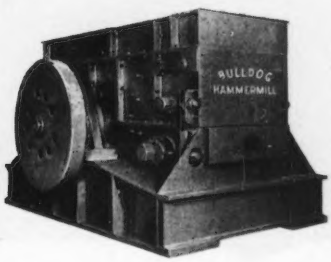
Before	After
Operation required one primary double roll, 8 screens, two secondary double rolls, with auxiliary equipment. Continuous clogging, produced irregular finished product, consumed excessive fuel in drying, extruding operations expensive.	Installing one Bulldog Hammermill. One stage operation, no clogging—no delays or shut-downs. Now produces a uniform cubicle product easily dried, saving fuel. Saves labor, maintenance, fuel and produces a better finished product.

Second Hammermill Purchased as a Result of Savings

CASE HISTORY No. 2
Rebuilding an existing operating Hammermill Crushing Limestone for cement

Before	After
Maintenance required replacement of 26,400 lbs. of manganese steel hammers and 12 sets of hammer bolts annually. Load capacity required extra operating hours. Primary grinding was not suitable for final roll type pulverizer.	With Bulldog rebuilding, the Hammer replacement was reduced to 3,600 lbs. manganese steel and one set of hammer bolts per year. Capacity increased 30% with less power consumption, better finished product saving power and maintenance in roll type pulverizer.

YOU CAN CUT COSTS - IN CAPACITY - IMPROVE PRODUCT



with a

New Bulldog Hammermill

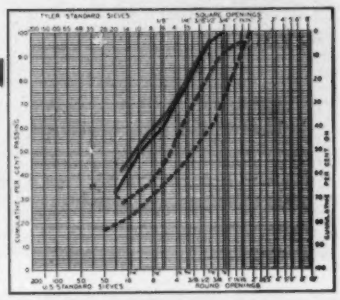
Compare your crushing operation with the actual proven results charted at right.

SOLID RED LINE indicates material from Bulldog Hammermill with screens in closed circuit.

DOTTED RED LINE shows Bulldog Hammermill no screens, open crushing.

SOLID BLACK LINE indicates standard impactor with screens in closed circuit.

DOTTED BLACK LINE indicates standard hammermill no screens, open crushing.



Bulldog Hammermills with Non Clog *Moving Breaker Plate* for sticky or high moisture materials or with *Stationary Breaker Plate* for dry materials are built in all sizes up to 72"x60" for primary, secondary, and fine reduction. Write for complete details.

A PRODUCT OF PETTIBONE MULLIKEN CORPORATION

Hammermills, Inc. is now a division of Pettibone Mulliken Corp., and has the tremendous facilities of PMCO. to back our products . . . with full control over research, construction and fabrication combined under one roof.

HAMMERMILLS, INC. • 4770 W. Division St.
Chicago 51, Ill. • Phone Spaulding 2-9300

division of

PETTIBONE MULLIKEN CORP. • 4700 W. Division St.
Chicago 51, Ill. • Phone Spaulding 2-9300

HAMMERMILL — CHICAGO
HAMMER — NEW YORK
UNIVERSAL — CEDAR RAPIDS

Want to Move a Mountain in a *Hurry?*

● The equivalent of a mountain must be moved in a few years to produce a profitable operation in many mines, quarries, coal stripping operations and big construction jobs.

If your requirements call for several years of high-yardage production in the toughest kind of digging, you'll want to know about the MARION 151-M.

It was developed expressly for companies that need to get big jobs done quickly and dependably. Examine the 151-M in detail—see its rugged, heavy-duty electrical system—its sheer strength and size—its record of dependability in the heaviest kind of work. Your nearest MARION sales office can give you the details—or contact the sales headquarters at Marion, Ohio.

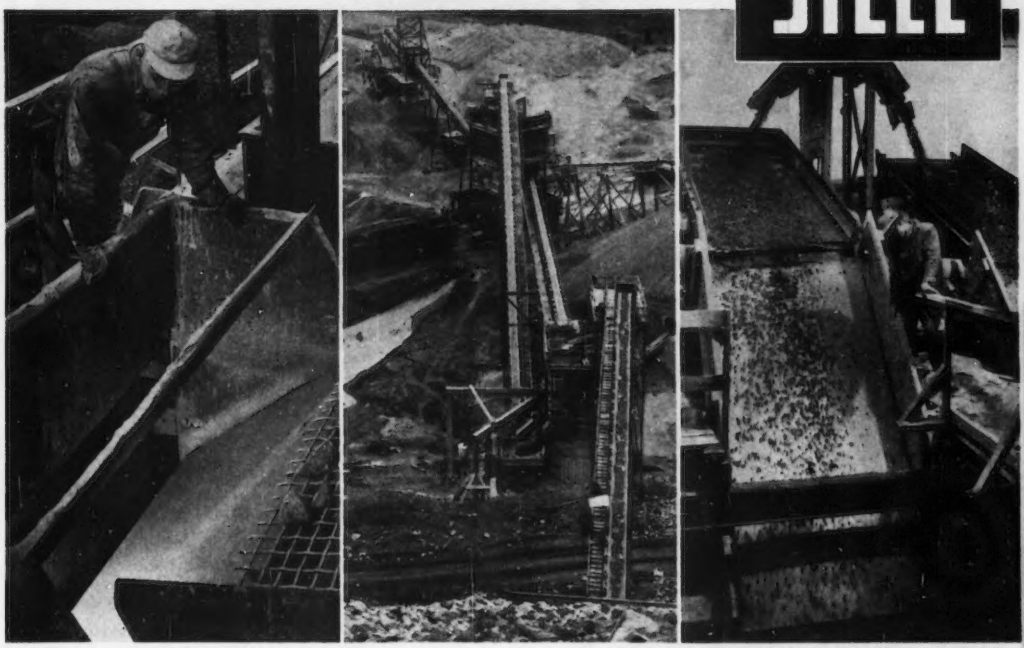
MARION POWER SHOVEL CO.
MARION, OHIO, U. S. A.

OFFICES AND WAREHOUSES IN ALL PRINCIPAL CITIES

from 3/4 cu. yd. to 45 cu. yds.

Superior Stone Company Reports
J & L JALLOY Heat-treated Steel
SAVES $200 PER TON installed

J&L STEEL



Center—*Superior Stone Company's Red Hill Quarry, showing screening, crushing and loading units.*

Left and right—*Jalloy heat-treated plates used extensively at Red Hill in chute liners and truck bottoms.*

Heat-treated Jalloy Chute and Truck Liner Plates Give 3 Times Longer Service at Superior's Operations

Superior Stone Company is cutting maintenance costs and increasing service life of equipment by standardizing on J & L JALLOY heat-treated plate for chute and truck body plates.

Typical of Superior's eight operations in Virginia and North Carolina is the large Red Hill, Virginia, quarry. Records at Red Hill show that J & L heat-treated Jalloy has a service life *generally three times longer than mild steel.* This means that for every ton of heat-treated Jalloy Superior Stone Company uses to replace mild steel, $140.00 is saved in cost of steel and $60.00 is saved in man hours spent for maintenance of chutes and truck bodies. **A total savings of $200 per ton of Jalloy installed.**

The result—J & L Jalloy is now installed as side and bottom liners in all chutes at Red Hill Quarry, in truck bodies and in several other miscellaneous applications.

Manufacturers and maintenance men alike have found that a yield strength 4 times that of mild steel and a Brinell hardness 4 times as great make heat-treated Jalloy an ideal steel for use in such applications as — Bulldozers — Scrapers — Rock Crushers — Shovel Buckets — Dump Cars—Truck Bodies—Chutes and Sand Blast Equipment.

If abrasion and impact are limiting the life of your equipment—and causing high maintenance costs—why not write for the booklet, "For Longer Wear, Less Repair"? It will give you the facts on J & L heat-treated Jalloy and how others are saving money with this modern mining and quarrying steel.

Jones & Laughlin Steel Corporation
412 Jones & Laughlin Building
Pittsburgh 30, Pa.
Please send me a free copy of your booklet, "For Longer Wear, Less Repair—Jalloy—J & L Special Alloy Steel."

Name_____

Company_____

Address_____

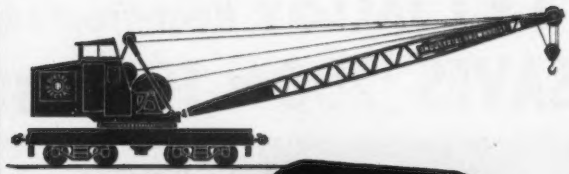
JONES & LAUGHLIN STEEL CORPORATION

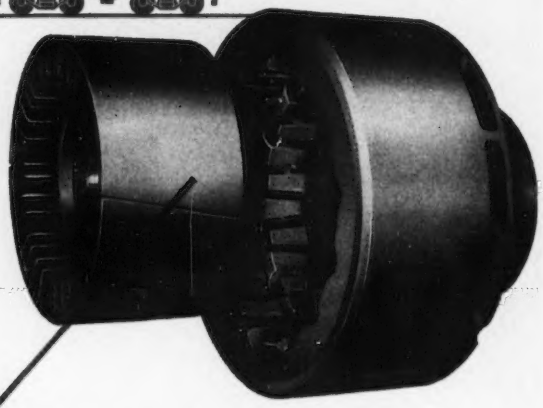
From its own raw materials, J&L manufactures a full line of carbon steel products, as well as certain products in OTISCOLOY *and* JALLOY *(hi-tensile steels).*

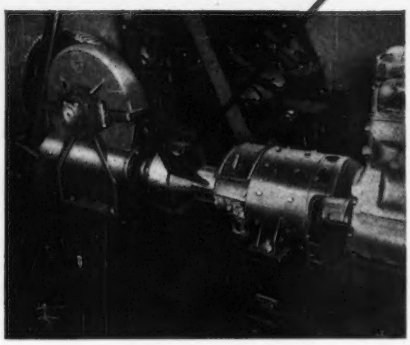
PRINCIPAL PRODUCTS: HOT ROLLED AND COLD FINISHED BARS AND SHAPES • STRUCTURAL SHAPES • HOT AND COLD ROLLED STRIP AND SHEETS • TUBULAR, WIRE AND TIN MILL PRODUCTS • "PRECISIONBILT" WIRE ROPE • COAL CHEMICALS

NOW AVAILABLE ON **BROWNHOIST** LOCOMOTIVE CRANES . . .

new dyna-matic clutch







For Smooth, Acceleration, and Control of Hoist, Rotating and Travel

The new, electrically operated DYNAMATIC CLUTCH, available only on Brownhoist locomotive cranes, provides a smooth, responsive flow of power never before possible with the usual disc or mechanical clutch for transmitting power to the machinery of a crane. The DYNAMATIC CLUTCH is essentially a driven rotor revolving on anti-friction bearings within a rotating coil energized by a small flow of current from the starting battery. The new DYNAMATIC CLUTCH has a 32-step control. Power response is steady and sensitive. Loads may be raised, lowered, or rotated smoothly and accurately without the use of mechanical brakes. Torsional impulse and vibration from the power source is completely eliminated. The DYNAMATIC CLUTCH provides a cushion between the engine and crane machinery. When clutch is fully engaged there is no appreciable slippage. Since there is no contact between the revolving field and armature, there is no friction between moving parts nor drag between the parts when the controller is in the off position — no parts need replacement other than inexpensive brushes. The new DYNAMATIC CLUTCH is one more good reason it pays to buy a BROWNHOIST.

BROWNHOIST

142

INDUSTRIAL BROWNHOIST CORPORATION • BAY CITY, MICHIGAN • DISTRICT OFFICES: New York, Philadelphia, Pittsburgh, Cleveland, San Francisco, Chicago, Canadian Brownhoist Ltd., Montreal, Quebec. AGENCIES: Detroit, Birmingham, Houston, Los Angeles, Portland, Seattle, Spokane.

Bear Brand Xanthates bring . . . Uniformity

BEAR BRAND XANTHATES
available

- Z-3—Potassium Ethyl Xanthate
- Z-4—Sodium Ethyl Xanthate
- Z-5—Potassium Amyl Xanthate*
- Z-6—Potassium Pentasol Amyl Xanthate*
- Z-8—Potassium Secondary Butyl Xanthate
- Z-9—Potassium Isopropyl Xanthate
- Z-11—Sodium Isopropyl Xanthate

*From Sharples Amyl Alcohols

The constant uniformity of Bear Brand Xanthates is one of the outstanding characteristics of these widely accepted flotation reagents.

Users know that any single drum or carload of drums can be depended upon to show the same quality as previous or subsequent shipments.

"Over Twenty-five Years Experience in Producing Xanthates for Metallurgical Use"

THE DOW CHEMICAL COMPANY
San Francisco 4, California, U. S. A.

GARLOCK MECHANICAL SEALS FOR *Rotary Shafts*

Where leakless operation of rotary shafts on pumps or other equipment is required, GARLOCK MECHANICAL SEALS will do the job.

There is no wear on the shaft when a Garlock seal is used. Sealing is effected by leakless and positive contact between carefully lapped metal-to-carbon or metal-to-metal mating surfaces. One of these elements rotates with the shaft and the other is stationary. The stationary element does not contact the shaft.

These precision-built seals are made in several standard designs and in a wide range of highest grade materials. The selection of design and materials depends upon the service in which the seal is to be used. If none of our standard designs appears entirely suitable for any specific application, a modification of a standard design or a specially designed seal will be engineered and built for that job.

Thousands of GARLOCK MECHANICAL SEALS have proved their effectiveness, durability and economy on shafts operating at high and low speeds and pressures. Users of Garlock seals are enjoying many months—or years—of trouble-free operation on equipment handling various liquids such as, for example, water, gasoline, beer, acids and paint.

If you need Mechanical Seals for any kind of a rotary shaft application, let Garlock's experienced engineering staff work with you. Write for our Mechanical Seal booklet.

THE GARLOCK PACKING COMPANY
PALMYRA, NEW YORK

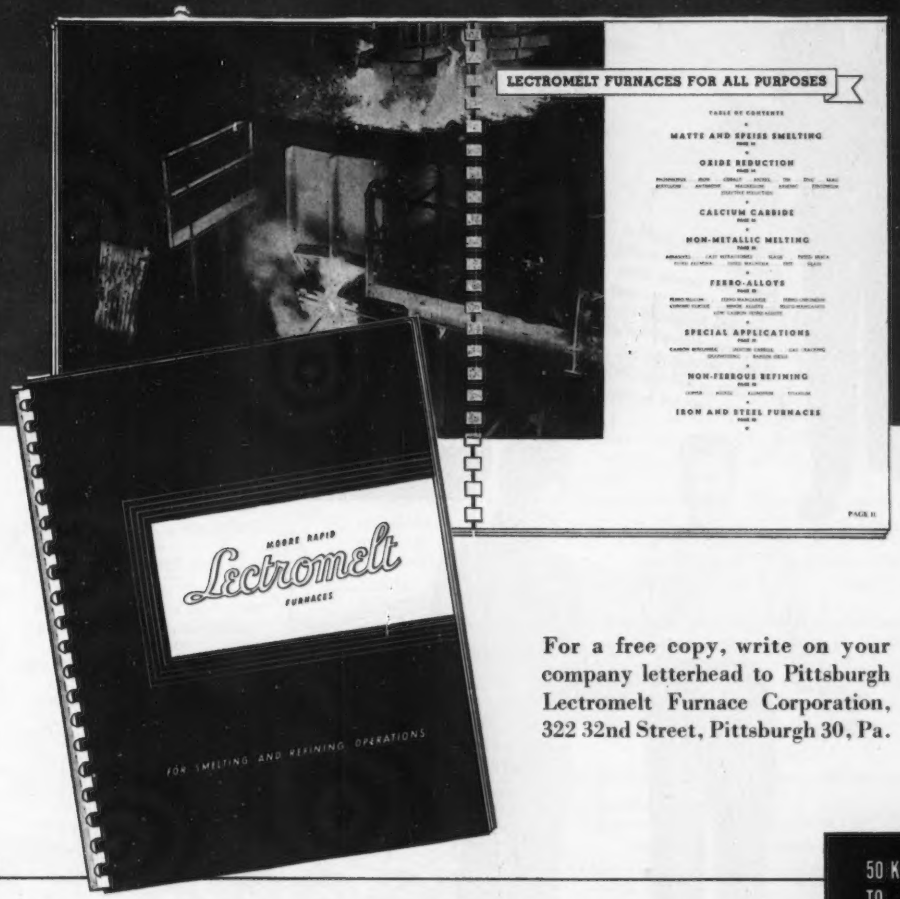
In Canada: The Garlock Packing Company of Canada Ltd., Montreal, Que.

GARLOCK

if

you're interested in doing any of these things with an Electric Furnace,

you need this new book



For a free copy, write on your company letterhead to Pittsburgh Lectromelt Furnace Corporation, 322 32nd Street, Pittsburgh 30, Pa.

WHEN YOU MELT... MOORE RAPID *Lectromelt*

"Proper maintenance can increase conveyor belt life more than 50%. We keep our Republic Record Maker Belt centered to avoid unnecessary edge rub."

"Republic Record Maker may be the right conveyor belt for your job, too. Give us a call and we'll soon find out. Republic Distributors like me make free analyses of every job. Our recommendations save you money."

Try Republic First...

REPUBLIC CONVEYOR BELTS SAVE LABOR

"Our lumber company greatly reduced labor costs with Republic Record Maker Conveyor Belting. At one spot alone, where rough oak planks are unloaded from boxcars, work efficiency has increased four times. The belt, in operation for more than 4 years, has long since paid for itself."

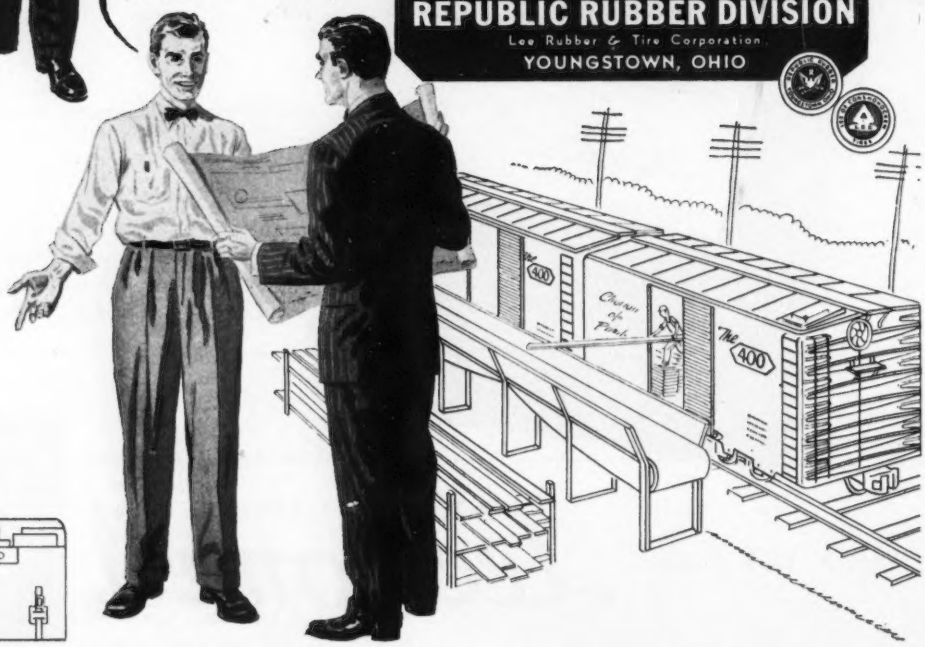
Republic Conveyor Belts eliminate hours of tough, unnecessary labor on the job. Republic Products, like the lumber-hauling Record Maker Conveyor Belt shown below, are made of quality materials especially chosen to give extra performance at minimum cost. Your Republic Distributor is an expert analyst who can quickly tell which of the hundreds of Republic Industrial Rubber Products is best suited to your line of work. Contact him today, or write us direct. Remember, for a half-century the Republic name has stood for performance through quality. For best results "Try Republic First!"

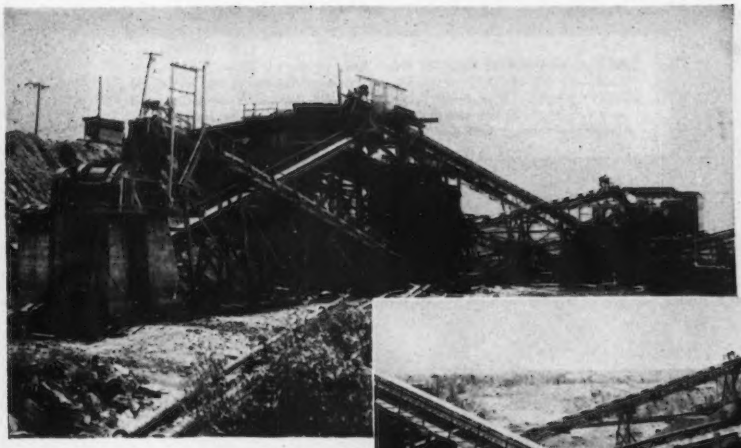
INDUSTRIAL RUBBER PRODUCTS BY

REPUBLIC RUBBER DIVISION

Lee Rubber & Tire Corporation

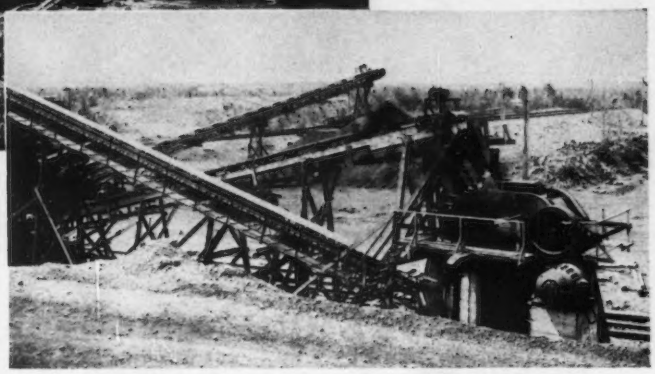
YOUNGSTOWN, OHIO

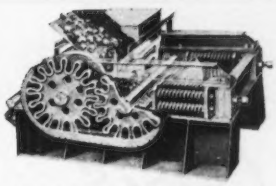




Preparation—beneficiation Plant of Pacific Isle Mining Company, Uno Mine, Hibbing, Minnesota.

Pioneer 54" x 24" Twin Roll Crusher operates in closed circuit, produces 1½" minus product.





No other Secondary Crusher can give you all these features:

1. **CONTINUOUS CRUSHING** for increased capacity
2. **FORCE FEED** . . . rock grabbed by rolls
3. **MORE MATERIAL CLOSER TO SPECIFICATION,** fewer fines
4. **EASY, POSITIVE ADJUSTMENT**
5. **PRODUCE SMALL MATERIALS** in large quantities
6. **LOW MANGANESE COST** per ton
7. **ALL GEAR DRIVE** for longer life
8. **STAR GEARS** drive floating roll
9. **TIMKEN ROLLER BEARINGS** . . . in self-aligning blocks.
10. **AUTOMATIC SAFETY RELEASE**

Roll Crushers

GET A NEW JOB AT UNO!

A uniform product is essential to heavy density separation. So when Pacific Isle Mining Company built a beneficiation plant at its Uno Mine located at Hibbing, Minnesota, they carefully studied the characteristics of various crushers. The iron ore varied from soft sticky "paint rock" to hard banded taconite.

Pacific Isle selected a Pioneer 54" x 24" Twin Roll Crusher. Since installation, it has proved most efficient in producing the uniform material desired. It receives material from a Pioneer 15" x 36" Jaw (set with a 3" opening) and in addition, 1½" to 4" material from a Sizing Screen. The Pioneer Roll Crusher reduces this combined material to minus 1½".

If you have any fine reduction jobs that are problems for traditional secondary crushers, call a Pioneer mining engineer. He'll show you why Pioneer Roll Crushers produce a more uniform product, closer to specification at less manganese cost per ton. Or, if you'd like data for your files, just check the coupon below. PIONEER ENGINEERING WORKS, 1515 Central Avenue, Minneapolis 13, Minnesota.

BUY BOTH!

Higher Output, Lower Upkeep!

Pioneer

Continuflo **EQUIPMENT**

PIONEER ENGINEERING WORKS
1515 Central Avenue, Minneapolis 13, Minnesota

Please send the material checked:

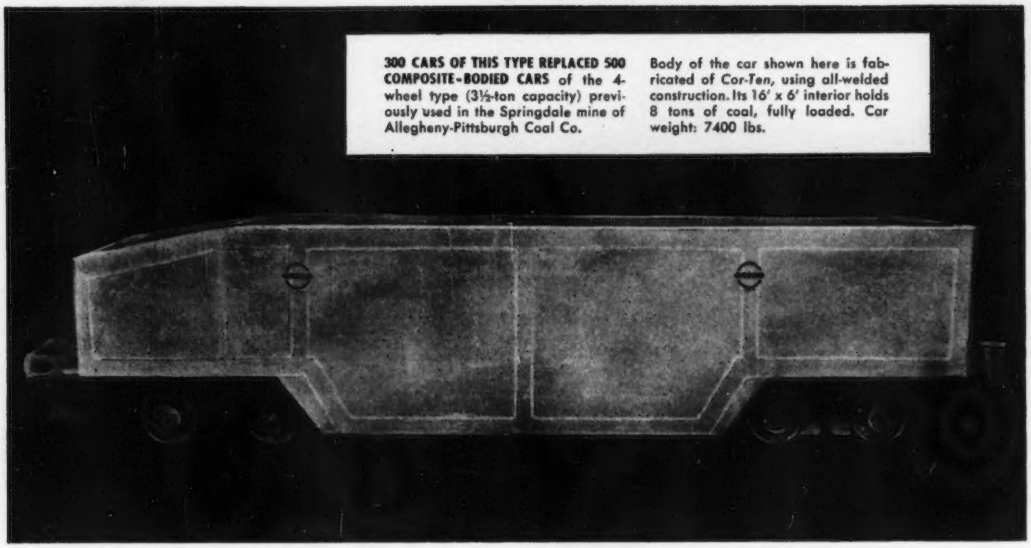
☐ Roll Crusher Catalog ☐ Heavy Duty Vibrating Screen Catalog
☐ New Conveyor Handbook ☐ Jaw Crusher Catalog
☐ Please have a mining engineer call

Name_____

Company_____

Address_____

City_____ State_____



300 CARS OF THIS TYPE REPLACED 500 COMPOSITE-BODIED CARS of the 4-wheel type (3½-ton capacity) previously used in the Springdale mine of Allegheny-Pittsburgh Coal Co.

Body of the car shown here is fabricated of *Cor-Ten*, using all-welded construction. Its 16' x 6' interior holds 8 tons of coal, fully loaded. Car weight: 7400 lbs.

EXAMINE A MINE CAR THAT

Cracks down on Costs...

This eight-wheeled car of eight-ton capacity minimizes car changes at loading machines, permits greater operating flexibility and substantially cuts maintenance expenses...

Moreover, it combines superior corrosion resistance and increased strength through use of high strength, low alloy steel containing nickel, produced by Carnegie-Illinois Steel Corporation under the trade name *"Cor-Ten."*

All side plates, end plates, bottom plates and gussets in this modern mine car are fabricated of *Cor-Ten* by the manufacturer, Irwin Foundry & Mine Car Company of Irwin, Pa.

During recent years, the use of this type of steel has increased at a remarkable rate. Produced under various trade names by leading steel companies, high strength steels containing nickel along with other alloying elements, provide three basic advantages for mine car construction:

1. **High strength, permitting increased strength (where section thickness remains the same as that of the carbon steel it replaces) or, in many cases, weight reduction.**
2. **Excellent behavior in fabrication, readily forming and welding.**
3. **Good resistance to abrasion, impact and corrosion.**

EMBLEM OF INCO SERVICE TRADE MARK

Because of unusually heavy industrial and defense demand, rationing of nickel has been in force since July 1st. However, we believe that dissemination of technical data and service experience can help to promote the intelligent utilization of critical materials, so essential in these times. We shall, therefore, continue to issue information on new developments and user experience with nickel-containing materials.

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK 5, N.Y.

MACKS make light of heavy loads . . .

Big Mack super-duty trucks make the hard jobs look easy . . . because in design and construction they incorporate numerous outstanding features that contribute to easy maneuverability, ease of control and positive traction regardless of terrain.

Powerful Diesel Engines! Hydraulic Power Steering! Air Assist Clutch! Flexible Rubber Shock Insulators! Mack's famed Balanced Bogie and Power Divider. All are Mack features that assure power and strength for the heaviest loads; flotation and traction for the most slippery mud or sand.

Your nearest Mack branch or distributor will give you the full story on what Macks can do for you in trouble-free, uninterrupted schedules . . . greater profits through greater output at lower cost. You'll find it's a story well worth hearing.

Only Mack gives you all the advantages of the famed Balanced Bogie. Positive traction because of exclusive Power Divider. No spring twist because of Mack Rubber Shock Insulators. Inherent flexibility eliminates chassis distortion. Extended tire life because of uniform tire loading. Minimum maintenance because of simplicity of design.

Mack TRUCKS

. . . outlast them all

Mack Trucks, Empire State Bldg., New York 1, New York. Factories at Allentown, Pa.; Plainfield, N. J.; Long Island City, N. Y. Factory branches and distributors in all principal cities for service and parts. In Canada: Mack Trucks of Canada, Ltd.

Literally DIRT CHEAP

Many manufacturers place a surprising importance on the recovery of 'dirt cheap' dust from their stack gas. One recovers over $4,000 a week, in dust worth less than a cent a pound. Another invested a 'long range' $40,000 in a high-efficiency dust recovery system...then recovered so much 'cheap' dust that he got his money back in 13 months! And, on the other end of the scale, a gold refiner recovers enough ore dust to reimburse him for his Buell dust collector several times a year!

What do these profitable dust recovery systems have in common? Just one thing...each was custom-engineered, designed and produced by Buell...These profit-producers are cyclone-type systems, with the patented van Tongeren 'Shave-Off'. And now, operating on the exclusive StediFlow dust-fall principle, Buell's new 'SF' Electric Precipitator stands ready to recover still finer dusts and fumes!

Perhaps Buell can help you, too, to turn dust-waste into profits. For more information, write for our new book on recovering valuable dust. Buell Engineering Company, 70 Pine Street, Suite 5035 New York 5, N. Y.

ELECTRIC CYCLONIC

buell

Engineered Efficiency in **Dust Recovery**

JOB PROVED...

10-Ton "EUC"

Emerging from a tunnel which leads to an underground loading area, this Model UD starts up the haul road to the crushing plant at C. A. Langford Stone Company in Tennessee.

The Acme Construction Company uses this 10-Ton Rear-Dump on a highway construction job at Matoaka, W. Va. The "Euc" is loaded with earth and shale by a 1¼ cu. yd. shovel.

Powered by a 125 h.p. diesel engine, the Model UD has a top speed of 35.7 m.p.h. and plenty of power for steep grades. The 860' haul road at the C. A. Langford quarry near Cookeville, Tenn., has a maximum grade of 10%.

High dumping angle and fast-acting Euclid hoist assure quick dumping. Here the "Euc" dumps a capacity load of limestone into crusher at the H. & R. Stone Company quarry at Ridgeville, Ind.

Built for jobs requiring a smaller capacity hauling unit for heavy off-the-highway service, the 10-Ton Rear-Dump Euclid has made good ... hauling more tons at less cost in mines, quarries, construction and industrial work. Owners like the Model UD because it is easy to handle ... has ample power and speed ... and can do a wide range of jobs economically.

You can depend on the 10-Ton Euclid for greater job profits and long service life. Your Euclid distributor will be glad to discuss your job requirements ... write or call him today for information on the Model UD Rear-Dump or the complete line of Euclid earth moving equipment.

THE EUCLID ROAD MACHINERY CO.
CLEVELAND 17, OHIO

EUCLIDS *Move the Earth*

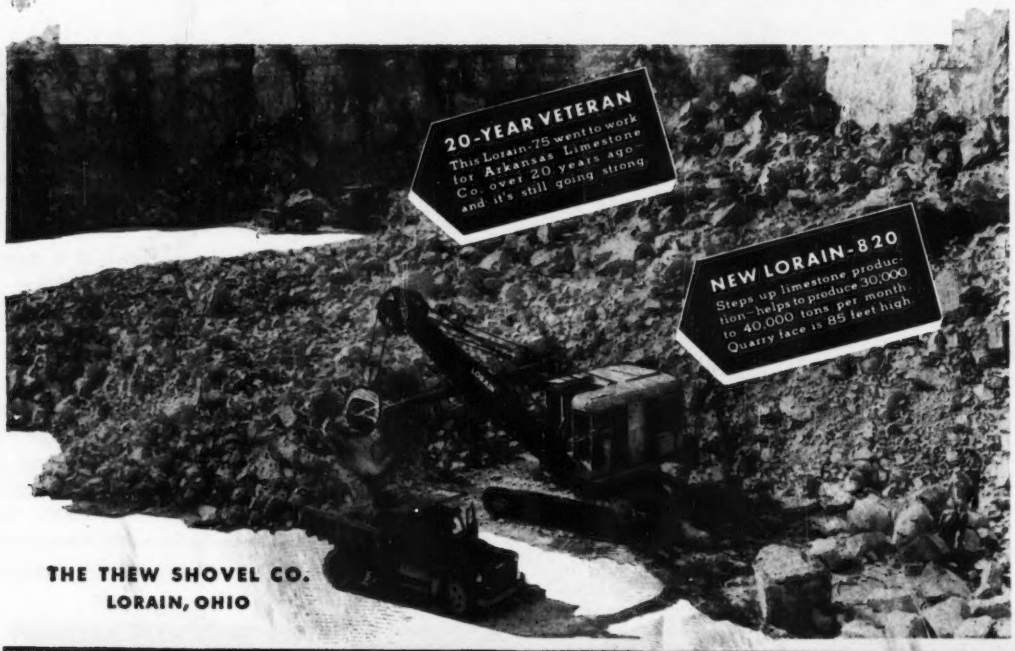
HISTORY REPEATS...

AT THE ARKANSAS LIMESTONE CO.

There's 20 years difference in the ages of these two Lorains working in the Arkansas Limestone Co. quarry at Myersville Spur, Oklahoma. The 20-year veteran (in background) is a Lorain-75 and still at it. Up in front, it's a husky, new 2-yard Lorain-820 shovel that has all the rock-digging qualities of its "grandpappy"—plus important new Lorain features that are the latest advancement in a rock digging shovel...

- Hydraulic Coupling—No Stall—No Shock
- Double Center Drive Pinion for Power Concentration
- Extra Wide Clutches—Sure-Acting—Long-Life
- Independent Chain-Drive 2-Speed Crawler
- New, Wider Crawler Treads—Drop-Forged, Break-Resistant
- All-Welded, All-Steel Shovel Boom
- Powerful, Independent Chain Crowd

Only by constant improvement through the years have new Lorain-820's earned their reputation as the big, heavy-duty shovels for the toughest digging in mines, pits and quarries. And you can be sure that these modern, new Lorains will outlive the old-timers that have stacked up records of 20 and 30 years or more. Get the "820" long-life story from your Thew-Lorain Distributor.


20-YEAR VETERAN
This Lorain-75 went to work for Arkansas Limestone Co. over 20 years ago—and it's still going strong.
NEW LORAIN-820
Steps up limestone production—helps to produce 30,000 to 40,000 tons per month. Quarry face is 85 feet high.

THE THEW SHOVEL CO.
LORAIN, OHIO

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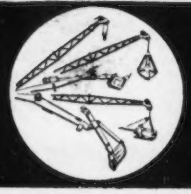

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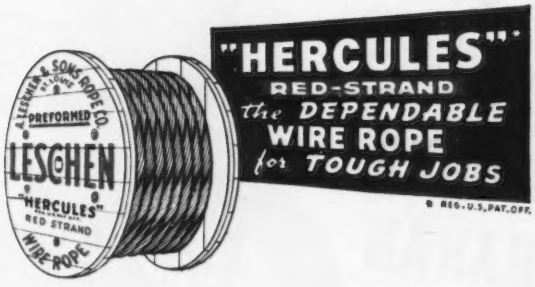
HOES

Yes, Just a Piece of Wire BUT...

upon its quality and fabrication depends the kind of wire rope service you will get.



If this wire goes into a rope of the 6 x 19 Seale Construction with a fiber core, it will be just one of 114. But if it is a "HERCULES" (Red-Strand) Wire Rope, *every* one of the 114 wires will have been rigidly tested to make sure that it met, fully, our exacting standards as to *all* essential properties. Furthermore, the rope will have been designed and fabricated according to the most advanced methods of manufacture.

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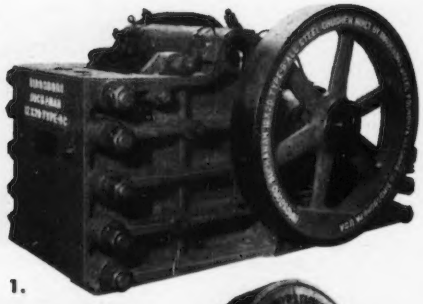

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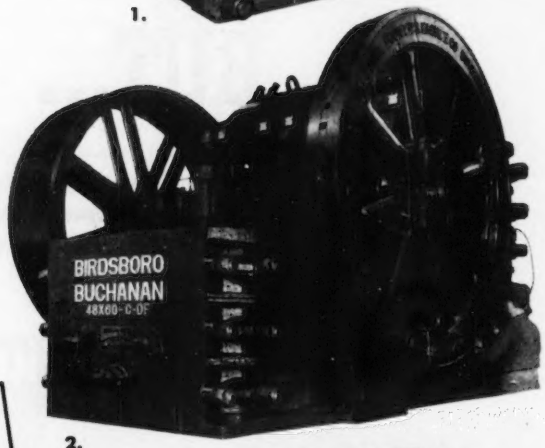

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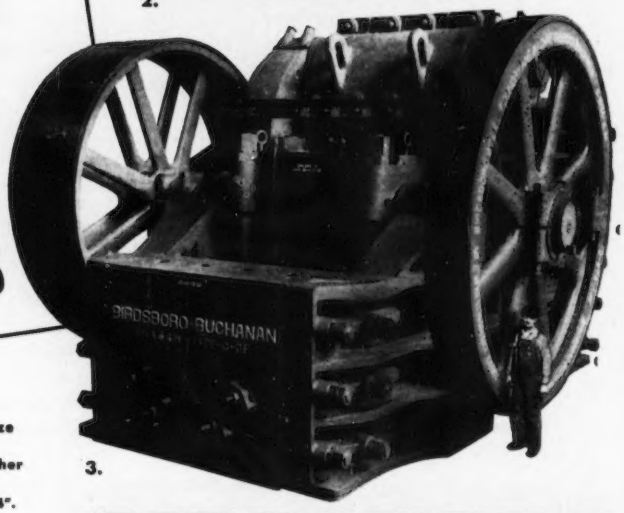

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Only battery cars are "permissible"

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Can produce 10% more tonnage
Deliver more tons per man shift
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Include all design advances
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Are more dependable and predictable
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Produce coal in shuttle car sections for approximately ½c less per ton* —in hand-loaded sections, as much as 75c a ton

*Shuttle Car Haulage, AIME, Technical Publication No. 2198.

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Battery-powered shuttle cars enable continuous mining machines to work 10% more of the shift.

AND . . .

Two-shift operation is now possible with only one set of batteries.

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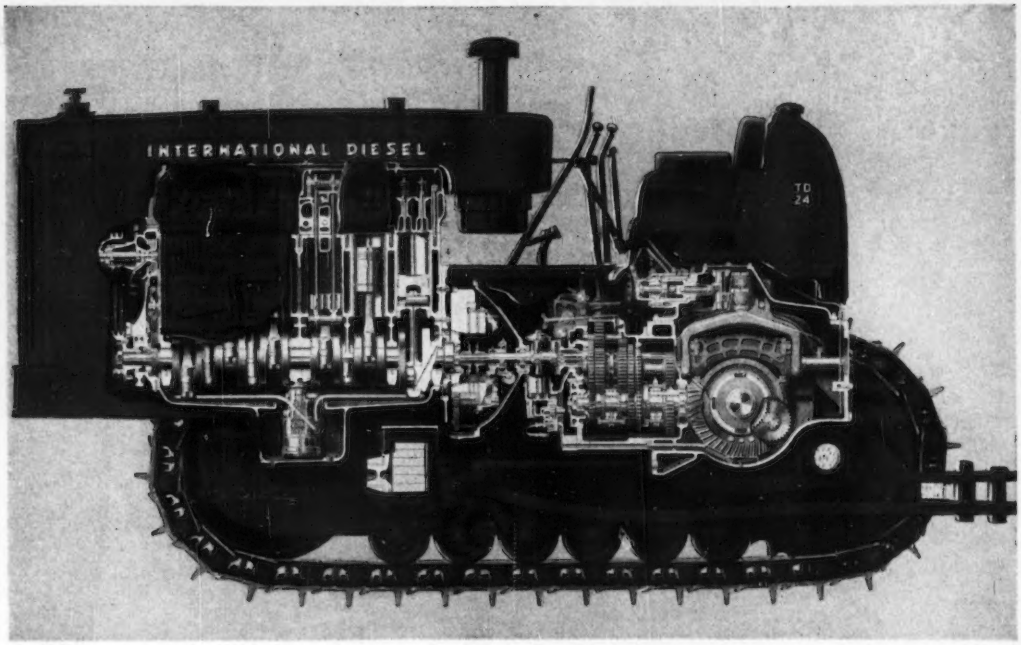
GUTS OF A CHAMP



Inside story of the TD-24

When two-legged people have guts, they finish the fight and do the job.

Real guts—that's what the world admires—man or machine.

You can't define what makes guts in a man, but you can "analyze" the fighting, working, dogged innards of the Champ. So let's put the X-ray on the TD-24:

Drawbar Horsepower: 148 working horsepower delivered at the drawbar in official tests.

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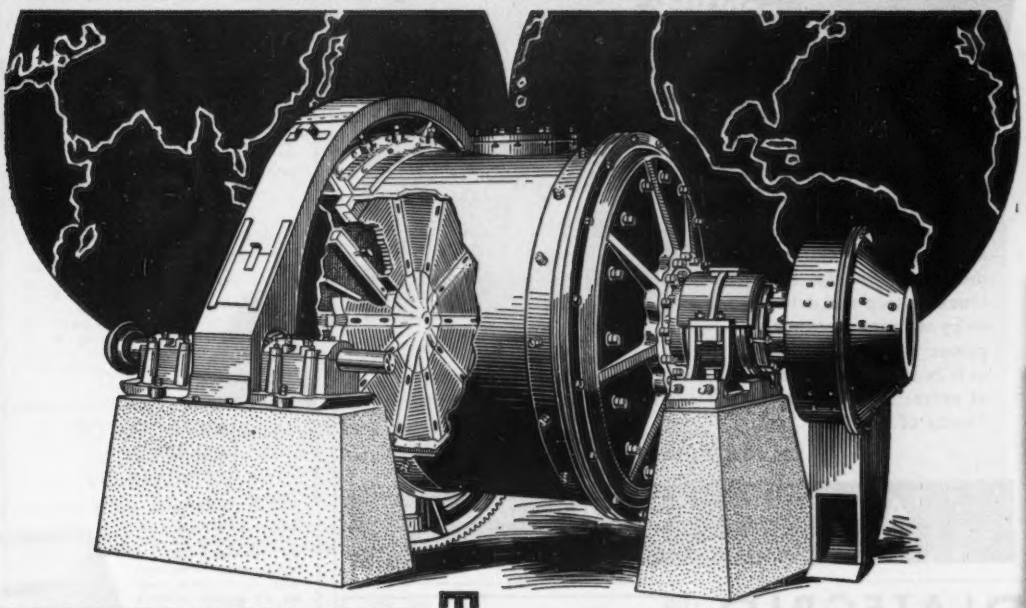

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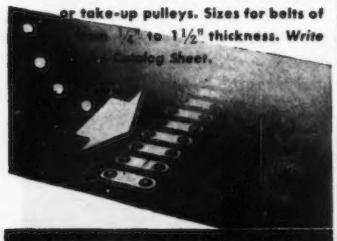

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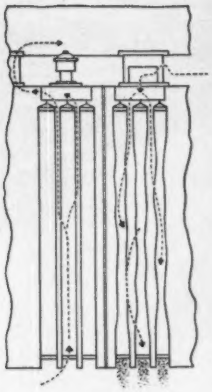
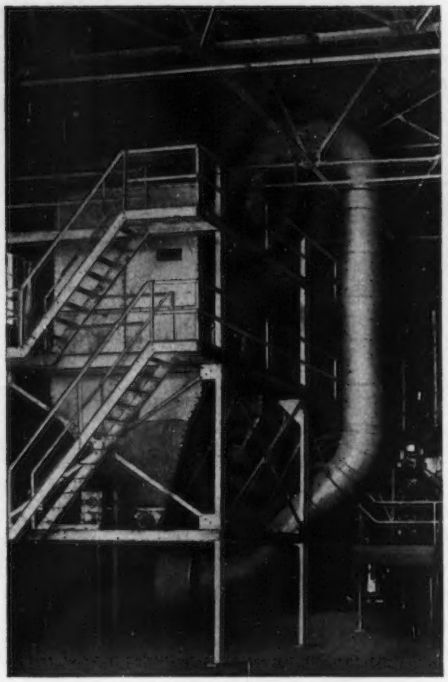
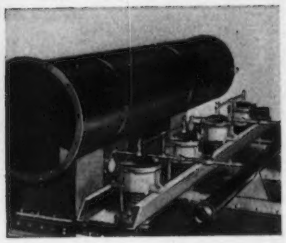


Shown above dust laden air moving upward, distending bags. Right half of cut shows reversed air current as bags are shaken and cleaned. At right the exterior of entire unit.





Close-up of automatic shaker units and an air reversal valve. Norblo bag shaking involves only one compartment at a time for only 10 seconds. Timing cycle is variable for dust loading, without shutting down.

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In a number of presently very important industrial jobs Norblo automatic bag type dust and fume collectors are making new records for high efficiency. The basic principles of bag cleaning, one compartment at a time, with combined shaking and air reversal, are shown above. Norblo automatic cleaning is variable for dust load; timing can be changed without shutting down the unit, and any compartment can be cut out for inspection or bag repair.

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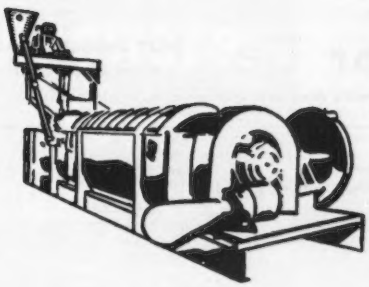
1950 AKINS vs. **Drum Type Separator** On Iron Ore



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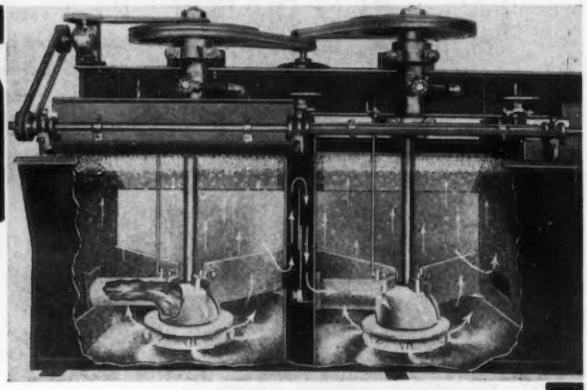

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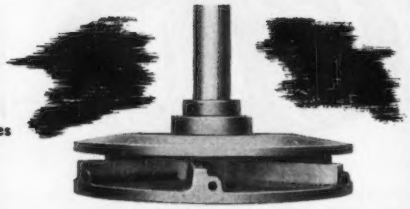

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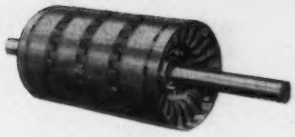

Dings *non-electric, self-energized* Perma Pulley magnets are recommended where burden depths do not exceed 3". Within this range, these are the magnets to use because of their unsurpassed concentration of magnetic strength near the surface. Catalog C-1007A.

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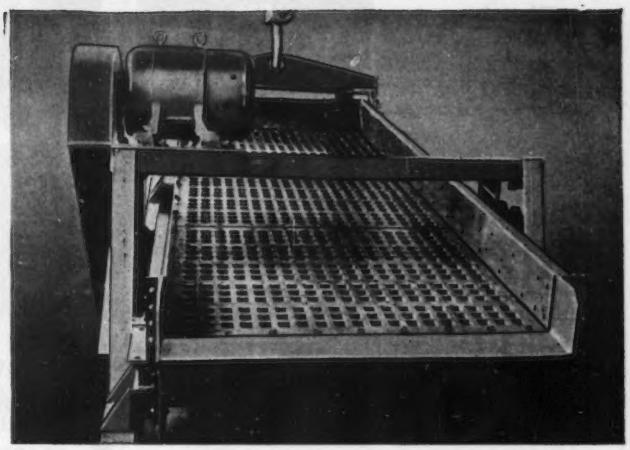

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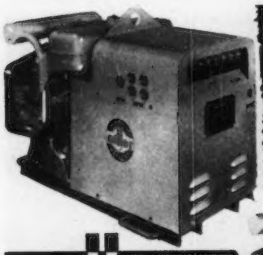

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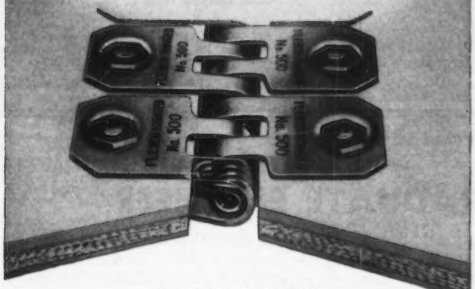

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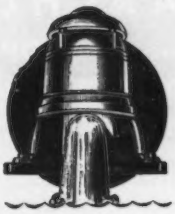

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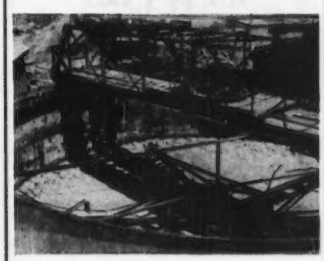

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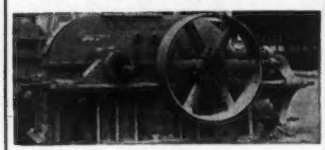

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16"	4	1/8"	1/32"	28 Oz.
18"	4	1/8"	1/32"	28 Oz.
20"	4	1/8"	1/32"	28 Oz.
20"	5	1/8"	1/32"	28 Oz.
24"	4	1/8"	1/32"	28 Oz.
24"	5	1/8"	1/32"	28 Oz.
28"	5	1/8"	1/32"	28 Oz.
30"	4	1/8"	1/16"	32 Oz.
30"	5	1/8"	1/16"	32 Oz.
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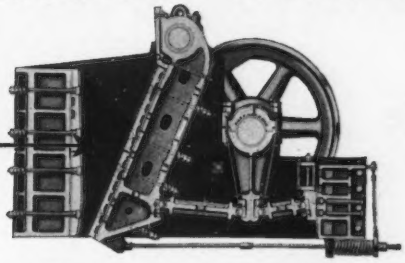

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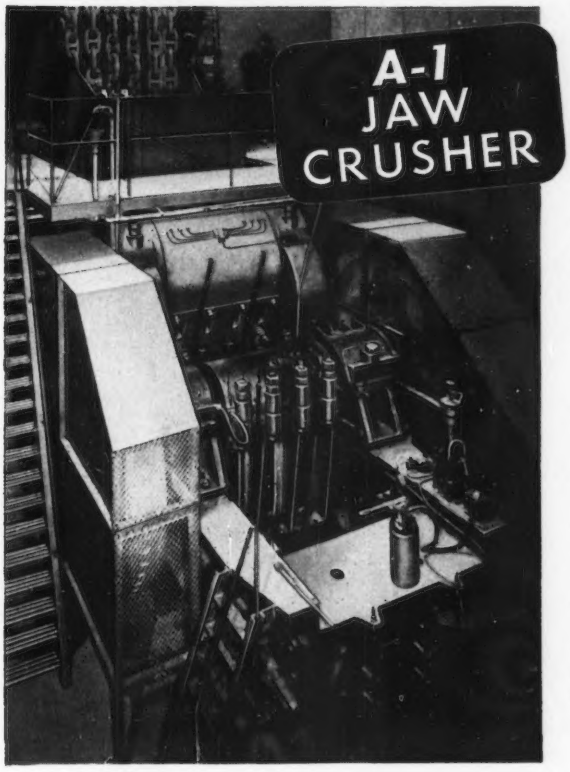

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